34th Year MAY, 1950

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Get excellent antioxidant protection plus the advantages of high solubility

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Neozone A is highly soluble in elastomers. It is up to ten times as soluble as Neozone D in natural rubber; in neoprene, up to four times as soluble. This means that, in stocks requiring high concentrations of antioxidant, large amounts of Neozone A can be used without danger of troublesome blooming which interferes with splicing and building operations. And, in the vulcanized compound, all of this antioxidant stays in the stick . . . provides lasting protection against deterioration due to normal aging, heat and flexing.

That's why Neozone A is so useful in heavy wire tubes and in premium-quality, heat-resistant belt stocks.

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● **Check the advantages of Neozone A in your products. Your Du Pont representative will be glad to give you complete information. Or write:**

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Rubber Chemicals Division
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BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

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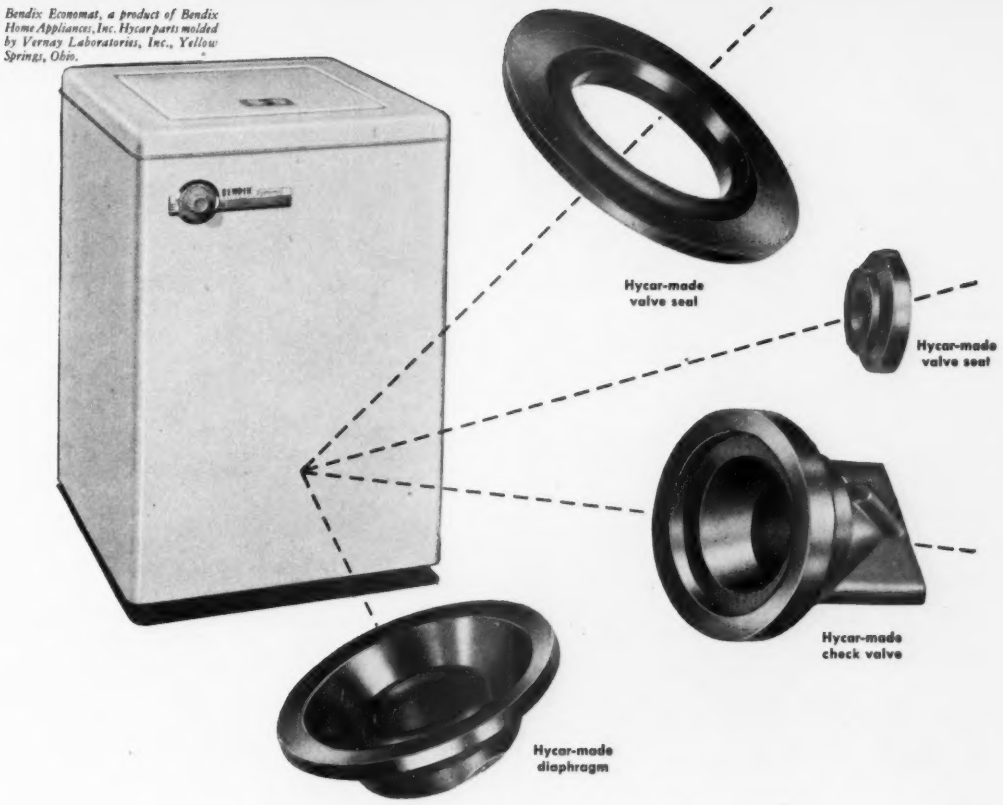

Bendix Economat, a product of Bendix Home Appliances, Inc. Hycar parts molded by Vernay Laboratories, Inc., Yellow Springs, Ohio.

Hycar helps put the *Squeeze* on washer costs!

THE engineers who designed the revolutionary new automatic washer pictured here came up with a hatfull of cost-saving, performance-improving features!

One of these is a flexible tub that "squeezes" water from clothes. Two more are a vacuum release and a check valve, made with Hycar American rubber. They control the water flow that rinses clothes. The entire principle of top draining and proper drying of the clothes is dependent upon the vacuum release valve operating without failure.

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Hycar
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American Rubber

Throughout, this unusual new washer shows ingenious use of materials and mechanisms that help reduce the cost to the manufacturer —and to the user.

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Specific Volume Resistivity, ohm-cm x 10^{16} = 35
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Dielectric Constant	1,000 cycles	1,000,000 cycles	60,000,000 cycles
	2.52	2.60	2.5
Power Factor, %	0.045	0.051	0.9

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It reinforces GR-S and Buna N, increasing tensile, elongation, hardness, stiffness, tear resistance and flex-life.

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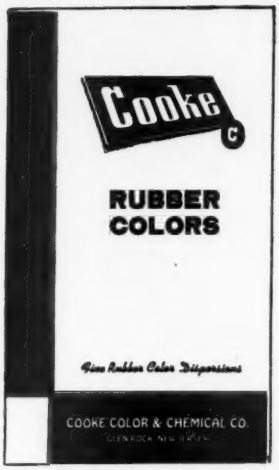

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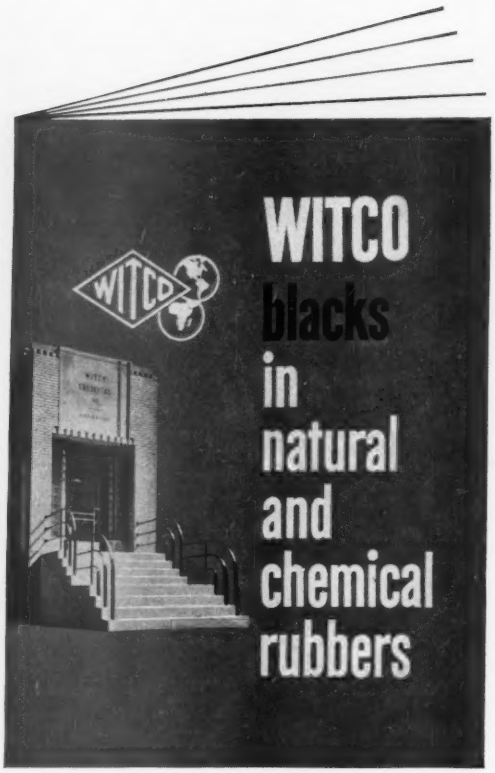

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CIRCULATION Properly assured in steam heated or water cooled platens by design and special precision manufacture.

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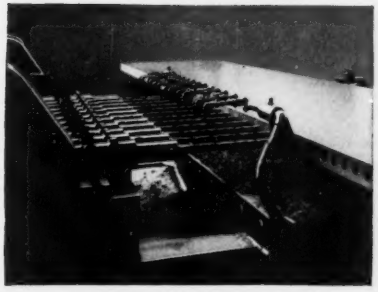

Specially designed and built multiple spindle drill for insuring parallel ports on true center line of platens.

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Write without obligation, for information on *precision built* R. D. Wood Heating Platens, for use in any standard or special application.

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● **FINE particle size white pigment. Brightness 90-92. GOOD reinforcing. Excellent *processing*.**

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"Packaged"

OIL - HYDRAULIC

LEAD ENCASING PRESS

Compactness is the key-note in the design of this new press . . . for it is indeed a "packaged" unit, incorporating in a single construction the pump, drive, valves, speed control devices, oil reservoir, etc. This not only results in saving floor space but keeps major pressure lines short and direct.

Robertson's standard of rugged construction has been maintained throughout to assure maximum servicability. The use of oil for the hydraulic fluid provides perfect lubrication and longer life of working parts.

A wide margin of safety is provided in the pump which is designed for 7000 p.s.i. although only 6000 p.s.i. pressure is normally used.

For a press with maximum efficiency and dependability and minimum maintenance . . . investigate the new Robertson "Packaged" Oil-Hydraulic Lead Encasing Press.

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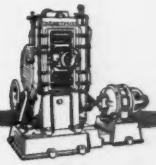
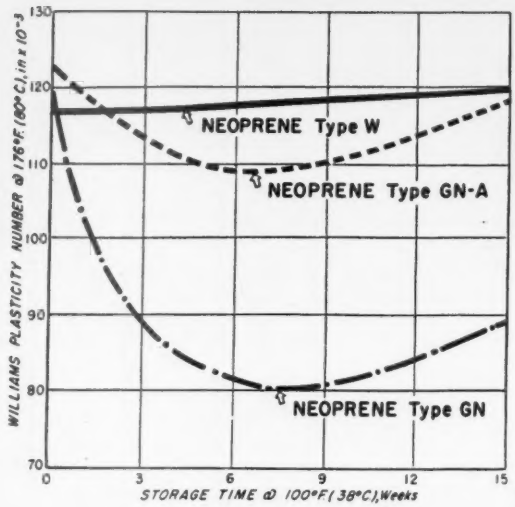


Lead Sheath Stripping Machine

Don't Risk Summer Processing Trouble!



Effect of Storage on Plasticity of Neoprene

USE NEOPRENE TYPE W

Stable in storage, even at midsummer temperatures

If you're looking for a neoprene polymer which undergoes practically no change in plasticity, milling behavior, scorching tendency or cure rate due to storage, try Neoprene Type W. Even the heat of summer storage has little or no effect on the properties of Type W. For example, the data in the graph show that the plasticity of Neoprene Type W is almost unchanged even after 15 weeks' storage at 100°F.

Even more important, Type W retains its originally superior milling properties. This is illustrated in the table below, based on observations of the milling behavior of various neoprenes before and after storage. Note that even after 24 weeks' storage Type W is essentially the same as when made.

You'll find, too, that the scorching tendency and cure rate of Type W do not change, an important factor for efficient operation.

Milling Behavior of Uncompounded Neoprenes after Storage

Storage Time at 100°F. (38°C.)	APPEARANCE AFTER THREE MINUTES ON LABORATORY MILL HAVING A ROLL TEMPERATURE OF 122°F. (50°C.)		
	TYPE W	TYPE GN	TYPE GN-A
Original	Good continuous band free from holes.	Slightly rough with a few small holes.	Slightly rough with a few small holes.
6 weeks	Slightly smoother, but otherwise equal to original.	Continuous band but sticks excessively to mill rolls.	Rough surface with a few holes.
12 weeks	Same as 6 weeks.	Rough surface, sticks badly.	Rough surface with a number of holes.
24 weeks	Same as 6 weeks.	Same as 12 weeks.	Dark, rough and nervy.

Tune in to Du Pont "CAVALCADE OF AMERICA" *Tuesday Nights—NBC coast to coast*

● Don't risk summer processing troubles. If you're not already using Type W, it will pay you to try it now. Your Du Pont representative will be pleased to assist you in developing Type W compounds to fit your needs. Or write:

E. I. du Pont de Nemours & Co. (Inc.)
Rubber Chemicals Division
Wilmington 98, Delaware

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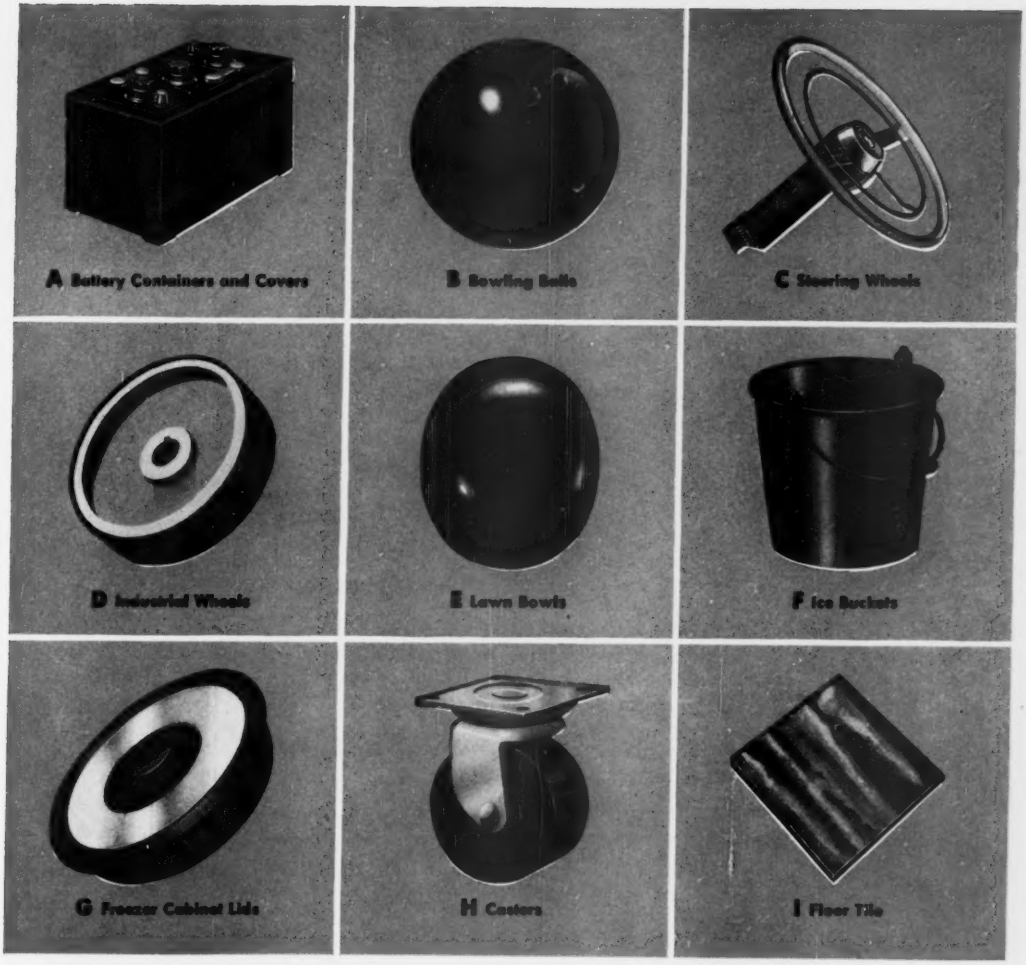
INDONEX PLASTICIZERS IN HARD RUBBER COMPOUNDS



"INDONEX" is now used by a majority of the leading hard rubber manufacturers.

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INDOIL CHEMICAL COMPANY

910 South Michigan Avenue • Chicago 80, Illinois

INDOIL

An important announcement to all Rubber Molders:

GENERAL ELECTRIC

NOW OFFERS YOU

An improved, more efficient Silicone Release Agent to help you mold better products

A new General Electric silicone emulsion for use as a mold release agent in the rubber industry offers important advantages to users.

This new emulsion (G-E 81161) has been thoroughly tested in the laboratory. It has already been used commercially, and accepted, by the largest rubber manufacturers. The introduction of this improved emulsion was purposely withheld until everyone concerned with the evaluation of the product was satisfied that it was right *in every respect.*

Here are some of the special features that this new G-E silicone emulsion 81161 offers users:

1. **Superior mold coverage—better performance on intricate molds.**
2. **Exceptional stability at room temperatures and above—it remains stable up to 150 F.**
3. **Hard water stability; it remains stable *24 hours at 750 PPM* in ½% dilution.**
4. **Stability under mechanical working; won't break or cream under *repeated* recycling in centrifugal pumping system.**
5. **Will not stain light-colored stocks.**

G-E 81161 is suitable for mold spray or bag dip. It is rust-inhibited, it has low toxicity, and many other important advantages. We suggest you *try* it yourself—see in your own plant how you can turn out better molded products, cut rejects, and increase production by reducing mold down time for cleaning. Write today for more details. Address Section J1, Chemical Department, General Electric Company, Pittsfield, Massachusetts.

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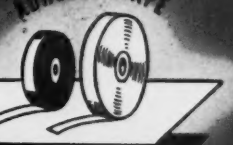

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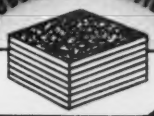
R-12 • R-16 • R-16[a]

RUBBER FLOOR TILE



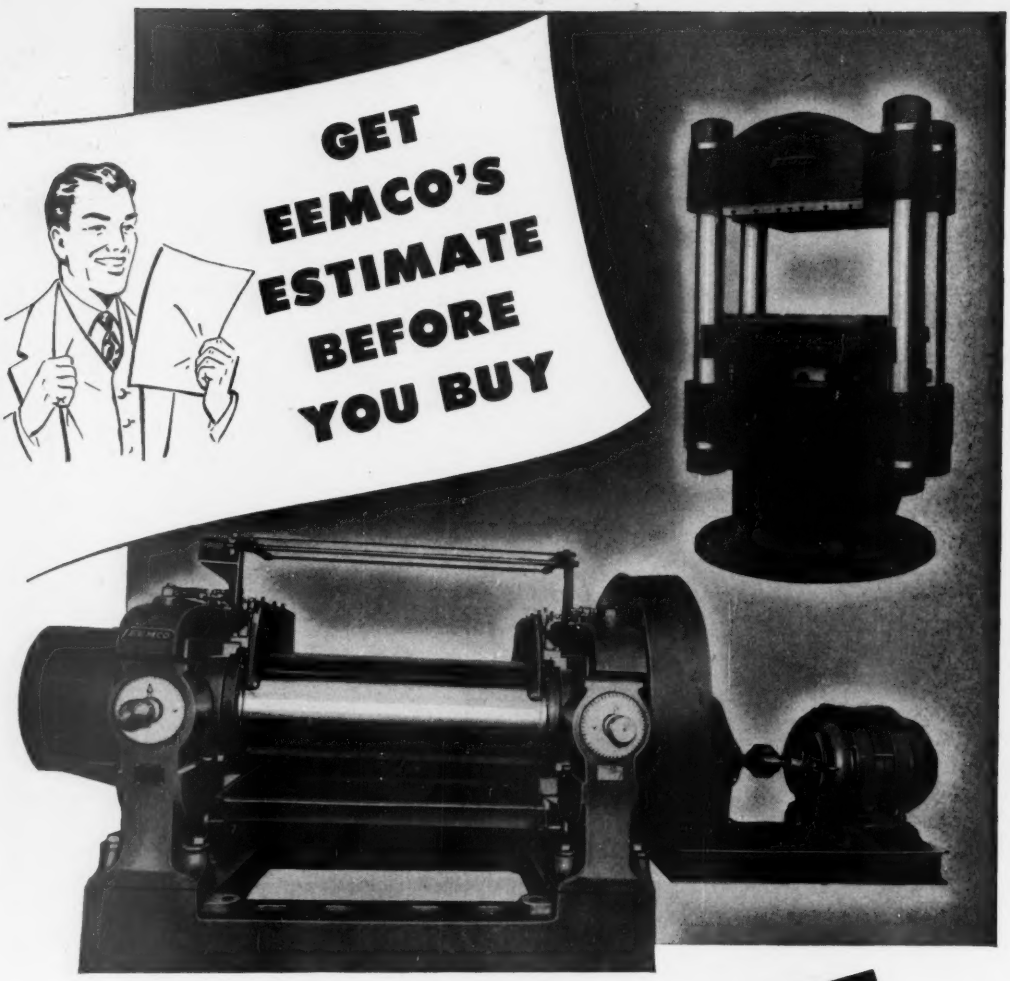
R-12 • R-16
LX-685

[a] Products listed are all coumarone resins except Nevoll and X-1 Resinous Oil

THE NEVILLE COMPANY
PITTSBURGH 25, PA.

Chemicals for the Rubber Industry

R-10



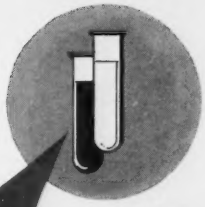
Yes, you will profit, as have many others, if you write to EEMCO for their proposition on Rubber and Plastics Processing Machinery. Engineered right, built right and of best obtainable materials you are assured of longer life and better production when you select EEMCO. If your present or future needs include any of the machines listed below, write EEMCO for a quotation. You will like their attractive prices and quicker deliveries. Standard and custom made, of course.

MILLS
PRESSES
REFINERS
CRACKERS
LABORATORY MILLS
LABORATORY PRESSES

EEMCO ERIE ENGINE & MFG. CO.
ERIE, PENNA

RUBBER AND PLASTIC
MACHINERY DIVISION

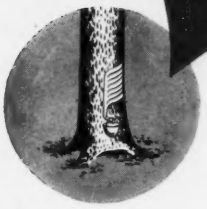
for Synthetic Rubber



SANTOCURE

cuts costs, improves quality

for Reclaimed Rubber



for Natural Rubber

MONSANTO CHEMICALS FOR THE RUBBER INDUSTRY

ANTIOXIDANTS
Flectol H*
Santoflex* B
Santoflex BX
Santoflex 35
Santowhite* Crystals
Santowhite MK

ALDEHYDE AMINE ACCELERATORS
A-32
A-77*
A-100

MERCAPTO ACCELERATORS
Santocure*
El-Sixty*
Ureka Base*
Ureka C
Mertax
Thiotax (2-Mercapto benzo thiazole)
Thiofide* (2,2' dithio-bis benzo thiazole)

GUANIDINE ACCELERATORS
Diphenylguanidine (D. P. G.)
Guantal*

ULTRA ACCELERATORS FOR LATEX, ETC.
R-2 Crystals
Pip-Pip
Thiurad*
Ethyl Thiurad (Tetra ethyl thiuram disulfide)
Mono Thiurad (Tetra methyl thiuram mono sulfide)
Methasan* (Zinc salt of dimethyl dithiocarbamic acid)
Ethasan* (Zinc salt of diethyl dithiocarbamic acid)
Butasan* (Zinc salt of dibutyl dithiocarbamic acid)

WETTING AGENTS AND DETERGENTS
Areskap* 50
Aresklene* 375
Santomerse* S
Santomerse D

MISCELLANEOUS MATERIALS
Thiocarbanilide ("A-1")
Santovar* A
Santovar O
Insoluble Sulfur "60"
Retarder ASA

COLORS **REODORANTS**

*Reg. U. S. Pat. Off.

Since prewar days, Monsanto Santocure has been the superior accelerator for vulcanizing rubber. It is a dependable, hard-working accelerator for natural, synthetic or reclaimed rubber, cutting acceleration costs, improving quality and adding a greater margin of processing safety. Santocure requires no special technique or handling. Santocure is available for immediate shipment. Mail the coupon for information. MONSANTO CHEMICAL COMPANY, Rubber Service Department, 920 Brown Street, Akron 11, Ohio.

MONSANTO
CHEMICALS—PLASTICS

MONSANTO CHEMICAL COMPANY
Rubber Service Department
920 Brown Street, Akron 11, Ohio

Without cost or obligation, please send information on Santocure; and on

.....

Name.....*Title*.....

Company.....

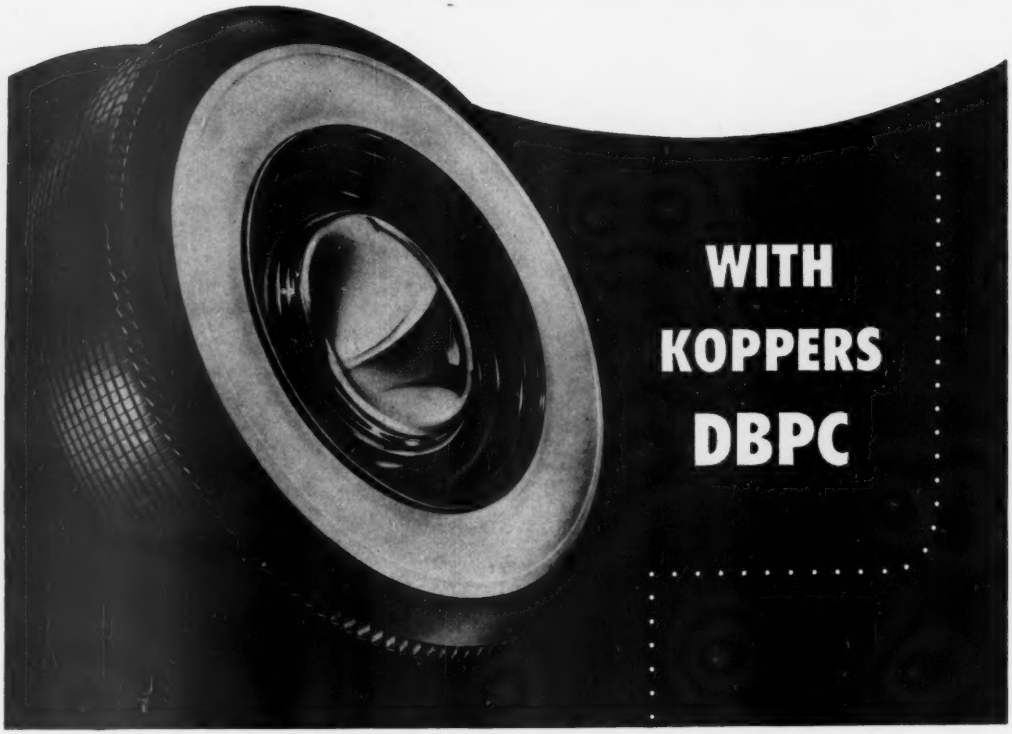
Street.....

City.....*Zone*.....*State*.....

SERVING INDUSTRY . . . WHICH SERVES MANKIND

How to obtain *effective age-resistance*

without discoloration or stain



WHITE SIDEWALL TIRES. Added to rubber compounds from which "white sidewalls" are fabricated, Koppers DBPC give age-resistance without causing discoloration.

MOST rubber compounds require the addition of an antioxidant material for age-resisting properties . . . to prevent cracking, checking, hardening and loss of strength. But most antioxidants tend to discolor the finished product or to stain materials with which they come in contact.

For white rubber products . . . white sidewall tires, crepe-soled shoes, sponge rubber cushions, sanitary goods, refrigerator gaskets, and the like . . . Koppers offers you Di-tert-butyl para-cresol (DBPC). Tests have shown that DBPC is an effective antioxidant with non-discoloring and non-staining qualities.

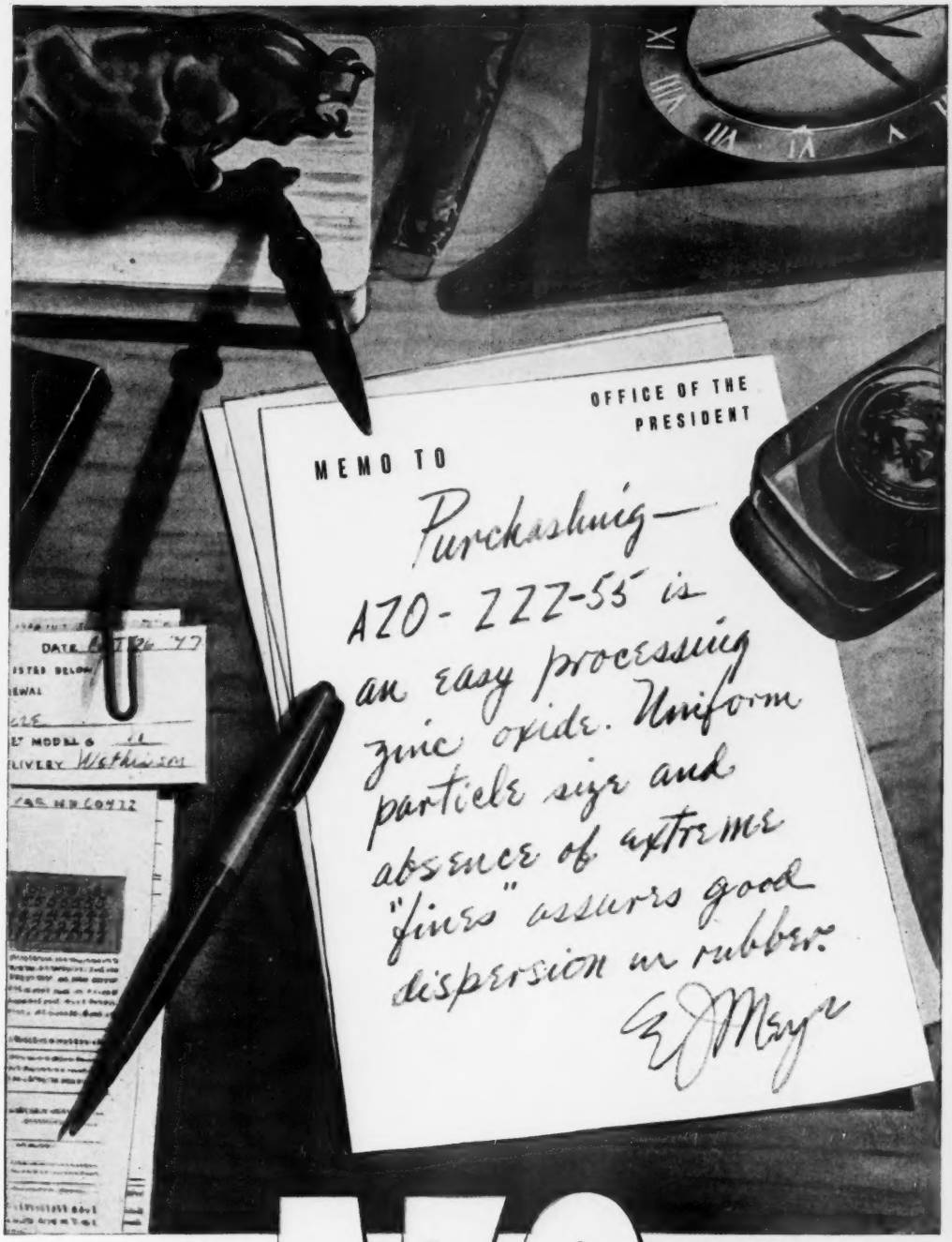
The effectiveness of Koppers DBPC as a rubber antioxidant in comparison with other commercially available antioxidants is discussed in detail in Bulletin C-9-115-2. Write for this bulletin and for other literature on DBPC. Send your requests to Koppers Company, Inc., Chemical Division, Dept. RA-5, Pittsburgh 19, Pa.

KOPPERS

KOPPERS COMPANY, INC.

Chemical Division

Pittsburgh 19, Pa.



Uniform-Dependable

AZO ZINC OXIDES

AMERICAN ZINC SALES CO.

Distributors for

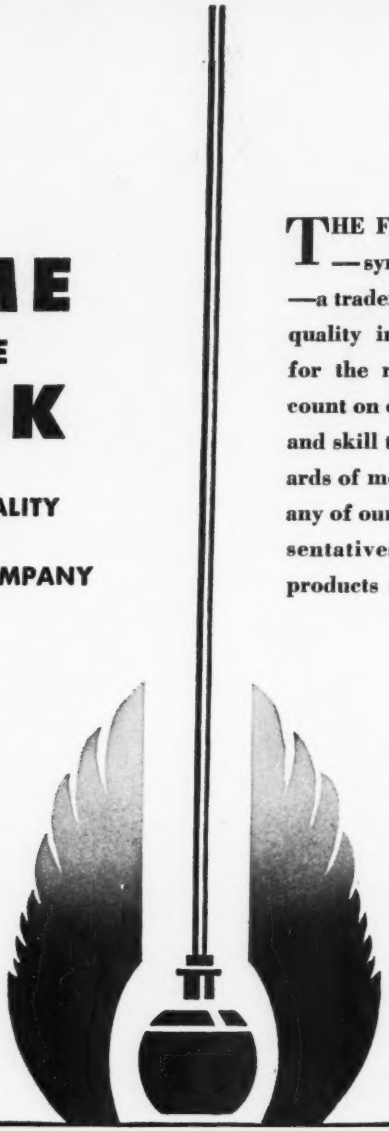
AMERICAN ZINC, LEAD & SMELTING CO.

COLUMBUS, OHIO · CHICAGO · ST. LOUIS · NEW YORK

THE
FLAME
AND THE
FLASK

SYMBOL OF QUALITY
Trademark of
THE C. P. HALL COMPANY

THE FLAME AND THE FLASK —symbol of the C. P. Hall Co. —a trademark that means precision quality in compounding materials for the rubber industry. You can count on our 30 years of experience and skill to meet the exacting standards of modern production. Contact any of our technically trained representatives for information about products that perform.



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AKRON, OHIO • LOS ANGELES, CALIF. • CHICAGO, ILL.

Precision Built
UNITED ROLLS
for the PROCESSING of
RUBBER
Plastics . . . Tile . . . Paint . . . Linoleum
and other Non-Metallic Materials

Corrugated Rubber Cracker Roll

Reg. T. M.

UNITED ENGINEERING AND FOUNDRY COMPANY

Pittsburgh, Pennsylvania

Plants at Pittsburgh · Vandergrift · New Castle, Youngstown · Canton

Subsidiaries: Adamson United Company, Akron, Ohio
Lobdell United Company, Wilmington, Delaware
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United rolls are in use in leading processing plants throughout the world. Their wide acceptance is the result of progressive research and more than 30 years experience in roll design and manufacture.

Consult us on your next requirement. Our engineers will be glad to assist you when specifying for conventional applications or for new or unusual processes.

Designers and Makers of Rolls and Rolling Mill Equipment

ANNOUNCING!

A NEW ZINC OXIDE that can Speed Your Production Step Up Your Quality Cut Your Processing Costs

PROTOX-167

This new pigment is the second in the modern Protox line of coated Zinc Oxides. You will find it is an all-purpose oxide for the activation and reinforcement of your many types of rubber products.

Protox-167 brings you all the well-known advantages of XX-66—the most used brand of American Process Zinc Oxide—plus all the benefits of an exclusive, patented* organic coating on [illegible]

PROTOX-167 Gives You All These Advantages

(compared with Zinc Oxides not of the Protox type)

FEATURES OF PROTOX-167 ZINC OXIDE	HOW YOU PROFIT
Lowest Moisture Pickup	Faster mixing More uniform mixing
Lower Dry Bulking	Less storage space Larger batches More output
Minimum Dusting	Cleaner handling
Organophilic Surface of Particles	Quicker incorporation Better dispersion Less power consumption
Scorch Inhibition	More production
Plasticizing Effect	Faster, smoother tubing and calendering Reduces die swell Cuts calender shrinkage Gives cooler running stocks
Higher Reinforcement	Improved tensiles Better tear resistance Higher modulus Greater resilience
Minimum Progressive Cure Even With Persistent Accelerators	Longer service life

Why not make a commercial test now to check these characteristics in your compounds?

*U. S. Patent 2,303,139

THE NEW JERSEY ZINC COMPANY

Founded 1848

160 Front Street, New York 7, N. Y.

PARDON ME . . .

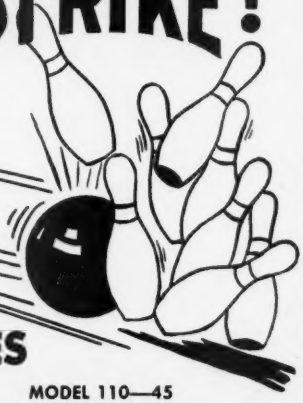
but you're stepping on our carbon black . . .

— And it's a good thing, too — for Cabot Carbon Black in your rubber soles and heels, boots and footwear, insures resistance to cracking and aging; gives lasting resilience and durability. The same Cabot Carbon Black that adds years of life to automobile tires and to rubber compounds in transportation units of all kinds helps to keep you stepping along.

GODFREY L. CABOT, INC.

77 FRANKLIN STREET
BOSTON 10, MASSACHUSETTS

ANOTHER STRIKE!



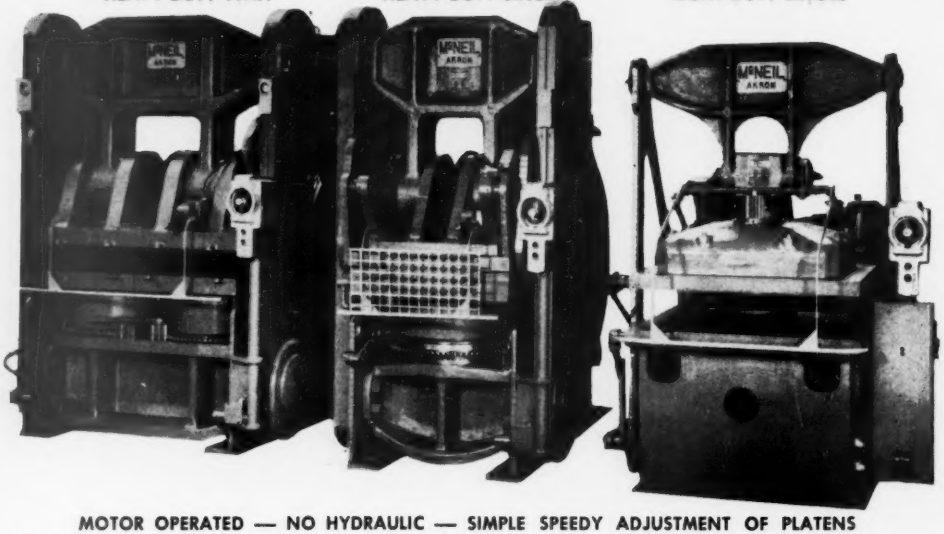
IN BOWLING,
WHEN A PLAYER MAKES
THREE CONSECUTIVE STRIKES, HE IS
SAID TO HAVE MADE A "TURKEY." WE AT
McNEIL HAVE ALSO MADE A "TURKEY" IN THESE THREE
MODELS OF OUR

MECHANICAL GOODS PRESSES

MODEL 800—24x24
HEAVY DUTY TWIN

MODEL 800—32
HEAVY DUTY SINGLE

MODEL 110—45
LIGHT DUTY SINGLE



MOTOR OPERATED — NO HYDRAULIC — SIMPLE SPEEDY ADJUSTMENT OF PLATENS

- 800,000 pounds total pressure
- Two 24" x 24" drilled platens Individually adjustable 1" minimum—6" maximum
- 700 pounds per square inch platen pressure
- Adjustments for mold loadings—zero to 200 tons each mold position
- Two 24" x 24" molds may be used in same or different thicknesses or one 24" x 48" mold

- 800,000 pounds total pressure
- 32" x 32" drilled steam platens
- 780 pounds per square inch platen pressure
- Adjustments of mold loadings—zero to 400 tons
- Range of mold thickness, 1" minimum to 5" maximum or 2" minimum to 6" maximum

- 110,000 pounds total pressure
- 40" x 40" drilled steel steam platens
- 70 pounds per square inch platen pressure
- Adjustment of mold loadings—zero to 55 tons
- Range of mold thickness, 4" minimum to 9" maximum

MANUFACTURING AGENTS

GREAT BRITAIN—Francis Shaw & Co. Ltd., Manchester, England
AUSTRALIA and NEW ZEALAND—Vickers Ruwolt Proprietary, Ltd., Victoria, Australia.

THE McNEIL MACHINE & ENGINEERING CO.

96 East Crosier St. Akron 11, Ohio

RUBBER WORKING MACHINERY • INDIVIDUAL CURING EQUIPMENT FOR TIRES, TUBES and MECHANICAL GOODS

UNIFORMITY

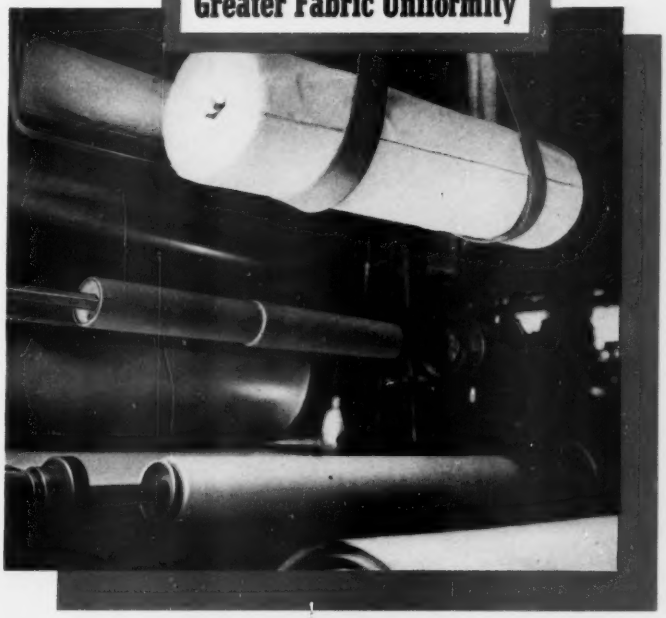
Makes the Big Difference

In INDUSTRIAL Fabrics

MT. VERNON FABRICS

Give You

Greater Fabric Uniformity



The greater uniformity of Mt. Vernon fabrics means *consistent* quality in your finished products—smoother, more efficient fabrication.

AT YOUR SERVICE

Mt. Vernon-Woodberry's staff of textile engineers is available on request to help you with your problems in development or application of industrial fabrics.

GAUGING FABRIC THICKNESS AFTER WEAVING. One of a series of comprehensive laboratory controls throughout production to assure uniformity in all Mt. Vernon-Woodberry products.

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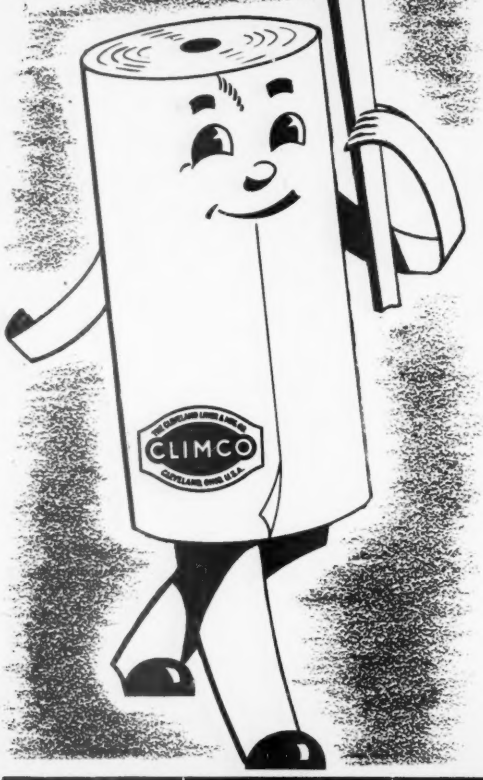
MR. CLIMCO SAYS . . . .

CLIMCO LINERS

save time at the bias cutter and cutting table



Perfect separation of stock and liner is all important during these operations—for stock adhesions at either point cause expensive down time. You can avoid such production headaches by using Climco Processed Liners that can be readily peeled from the stock without sticking.

Climco Processing of your liners assures many other profitable advantages: Liner life is greatly increased, tackiness of the stock is preserved, and gauges are more easily maintained. Latitude in compounding is enlarged, lint and ravelings are eliminated and horizontal storage is facilitated.

Since 1922 Climco Processed Liners have proved their worth to the rubber industry. Give them a trial in your plant.

THE CLEVELAND LINER & MFG. CO.
5508 Maurice Avenue • Cleveland 4, Ohio, U. S. A.
Cable Address: **"BLUELINER"**

ILLUSTRATED LINER BOOKLET

Tells all about Climco Liners and Linerette and how to get better service from liners. Write for your copy now.

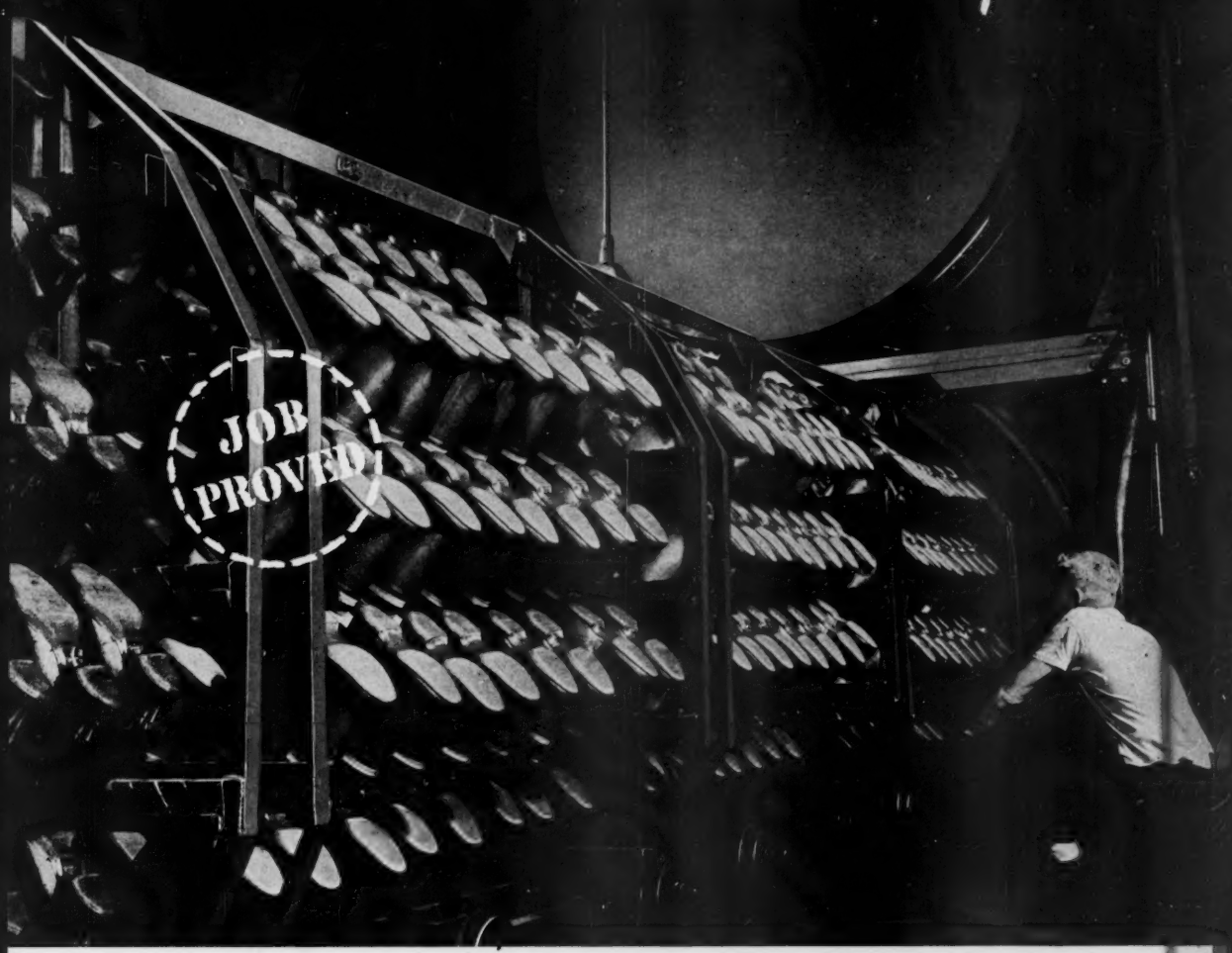
LINERETTE INTERLEAVING PAPER
Treatment Contains
NO OIL OR WAX
Samples on Request

CLIMCO
PROCESSED LINERS

Serving the Rubber Industry for 26 Years

CLIMCO

CLIMCO



UNIFORM PRODUCTION AT LOWEST COST

Sundex 53 Leads 15 Softeners in Assuring Proper Resilience, Required Elongation

To reduce operating costs, a manufacturer of rubber footwear ran comparison tests on 16 softeners for natural and GR-S stocks. Analysis of experimental batches indicated that only one other product—at a much higher price—could compare at all with Sundex 53.

Sundex 53 was therefore adopted as the softener for production batches. The uniform compatibility of Sundex 53 permits constant, adequate softening of compounding stock without loss of resilience in the vulcanizate. Also, required elongation is consistently achieved. Rejects are fewer than would normally be expected.

This case history of outstanding performance at lowest cost is typical wherever plants adopt Sun Rubber-Processing Aids. There is a "Job Proved" Sun product to meet your needs, too. Call or write your nearest Sun Office for more information.

SUN OIL COMPANY • *Philadelphia 3, Pa.*
In Canada: Sun Oil Company, Ltd.
Toronto and Montreal

Sun offers five "Job Proved" rubber-processing aids

1. **Circo Light Process Aid,** a general-purpose softener for neoprene and natural rubber.
2. **Circosol-2XH,** an elasticator for GR-S, a plasticizer for natural rubber.
3. **Circomar-5 AA,** a free-flowing softener of the asphalt-flux type that is easy to handle at room temperature. Widely used for natural rubber and GR-S.
4. **SunapticAcid-130,** a mixture of high molecular weight naphthenic acids and hydrocarbon oil. It functions in the same manner as stearic acid in the activation of curing agents for rubber. It is "non-blooming."
5. **Sundex-53,** a low-cost processing aid, highly compatible with natural and GR-S.

SUN PETROLEUM PRODUCTS
"JOB PROVED" IN EVERY INDUSTRY

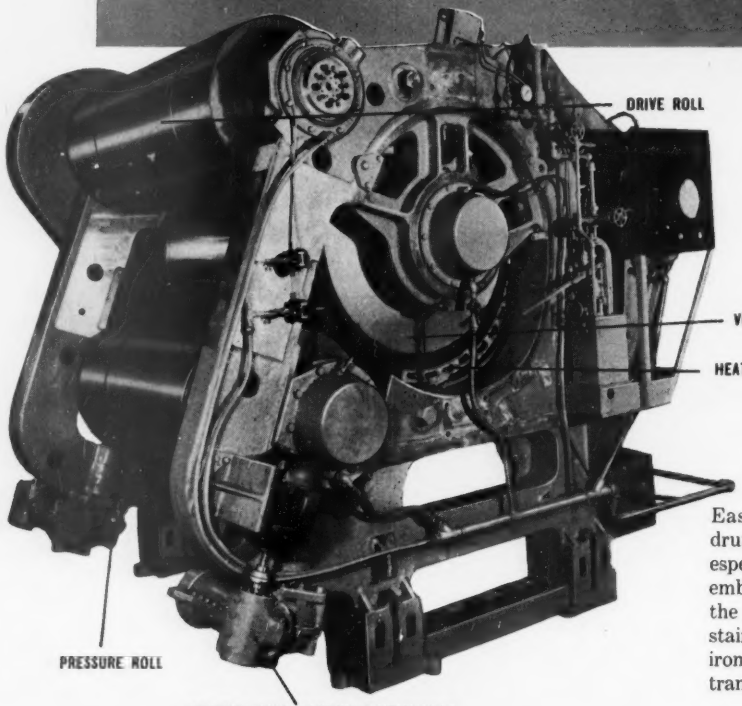
SUNOCO®

A completely new and redesigned

FOR CONTINUOUS

Permits roll and belt

A NEW ROTOCURE, DESIGNED TO GREATLY FACILITATE REMOVAL OF THE VULCANIZING DRUM AND REPLACEMENT OF THE STEEL BAND, IS NOW AVAILABLE AS A RESULT OF COOPERATIVE ENGINEERING BY ADAMSON UNITED COMPANY AND BOSTON WOVEN HOSE AND RUBBER COMPANY



Easy removal of the Vulcanizing drum to make quick roll changes is especially important when use of an embossed curing roll is necessary, as in the production of floor matting and stair treads. The changing of edge irons when producing conveyor or transmission belting is also facilitated.

The pressure (gauging) roll will withstand a separating force of 250,000 pounds per adjusting screw. It is contemplated that certain stocks can be calendered and cured in a single operation, gauging being accomplished between the pressure roll and the curing roll.

ADAMSON UNITED COMPANY

AKRON 4, OHIO

SUBSIDIARY OF UNITED ENGINEERING & FOUNDRY COMPANY

BRANCH OFFICES IN PRINCIPAL CITIES

ROTOCURE*

VULCANIZATION

changes in 1/10th the time!

One piece housings provide adequate "window" clearance for removal of the curing roll. A special "C"-Hook is furnished for supporting the roll as illustrated. All design details have been engineered to facilitate and speed roll changing. For example, all supply and return lines are quick-disconnect type. The heating shoes surrounding the Vulcanizing roll are automatically retractable.

Some desirable features:

- **All rolls are supported in self-aligning roller bearings, oil flood lubricated.**
- **Speed range is adjustable from ½ to 6.2 feet per minute.**
- **Vulcanizing roll is 60" diameter; 80" face.**
- **Tension roll is hydraulically actuated; maximum belt tension, 240,000 pounds.**

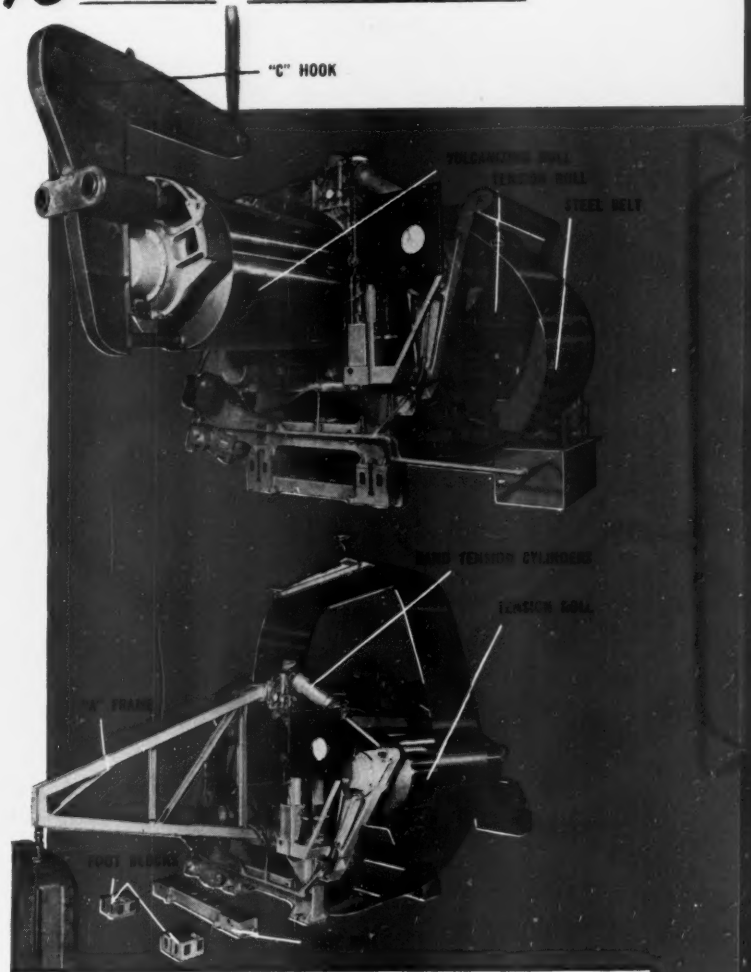
Easy replacement of the steel band is made possible by the ingenious arrangement illustrated. After the curing roll has been removed, the specially provided "A-Frame" is bolted in place and jacked up far enough to remove the weight from the base rail on the near side. The two "foot blocks" are then taken out, permitting the belt to be removed through the resulting opening.

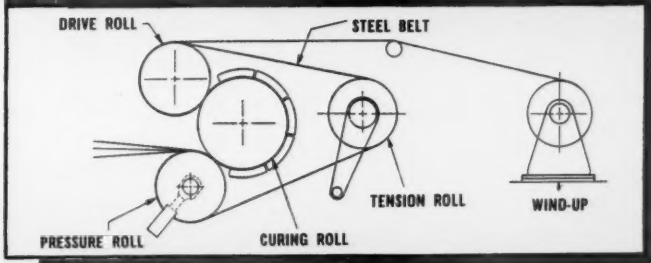
Operation of the Rotocure is shown schematically at right. The Rotocure has many advantages over the conventional press on large production runs. For example:

- **Increased production provided by continuous operation, which eliminates opening, cooling, reheating and closing.**
- **Elimination of overcuring and undercuring of the over-lap areas occurring on conventional presses.**
- **Greater uniformity of stretch.**

Our engineers are available for consultation concerning the possibilities of the Rotocure for your particular products.

**The Rotocure machine is a patented development of Boston Woven Hose and Rubber Company built by Adamson United Company under a licensing arrangement.*





an $8,000,000 expansion program for the production of ST. JOE lead-free ZINC OXIDES

AT JOSEPHTOWN, PA., *on the south bank of the Ohio River about thirty miles northwest of Pittsburgh, is the electrothermic smelter, which operates as a custom smelter, receiving both domestic and foreign concentrates.* Constructed in 1930, the plant was designed to produce zinc oxide and to process 120 tons per day of zinc concentrate obtained mainly from the Company's zinc mines in St. Lawrence County, N. Y. Expansion of the plant and equipment during 1939 and 1940 brought the processing capacity to upwards of 300 tons of concentrate per day. As a result of a postwar expansion program completed in 1950, at a cost of about $8 million, the plant's processing capacity has been doubled.

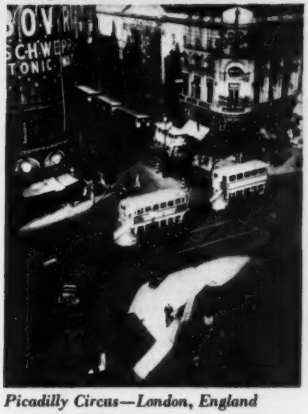
ST. JOSEPH LEAD COMPANY

250 PARK AVENUE • NEW YORK 17 • ELdorado 5-3200

Plant & Laboratory, Monaca, (Josephtown), Pennsylvania

Michigan Boulevard—Chicago, Illinois

Champs Elysées, Paris, France



Picadilly Circus—London, England

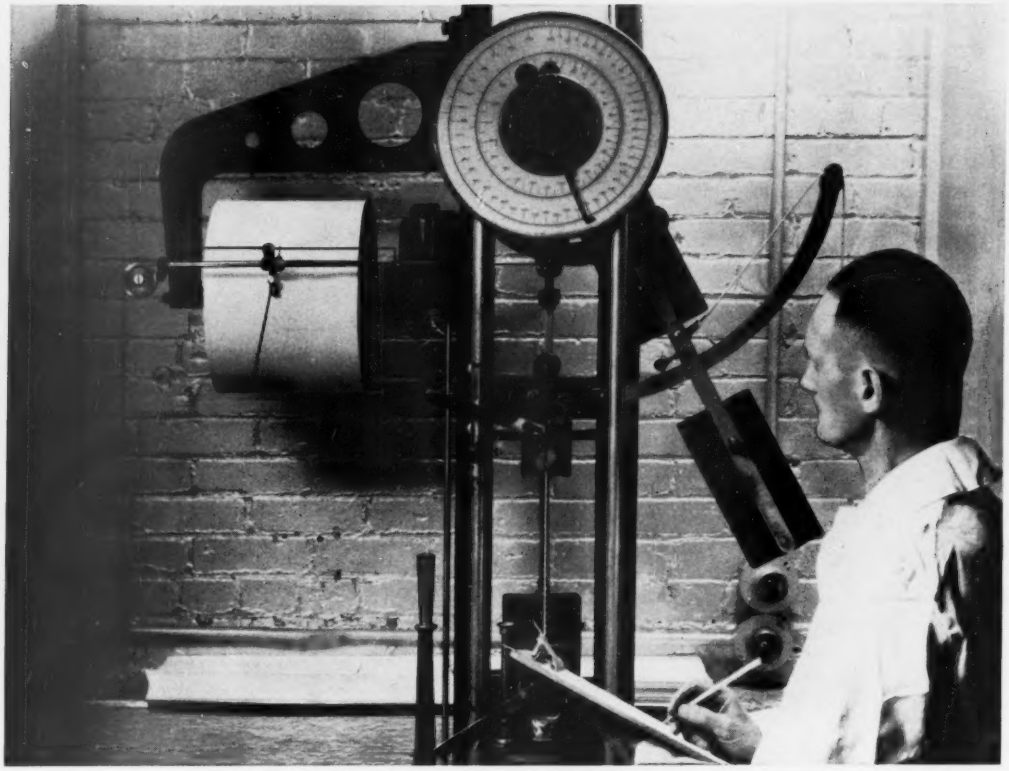
Calco

Why do more people in the world ride on tires made with MBT and MBTS than tires made with all other accelerators combined?

You will find the answer by comparing quality and figuring your savings per 100 pounds of rubber hydrocarbon.

AMERICAN Cyanamid COMPANY
CALCO CHEMICAL DIVISION
RUBBER CHEMICALS DEPARTMENT
BOUND BROOK, NEW JERSEY

SALES REPRESENTATIVES AND WAREHOUSE STOCKS: Akron Chemical Company, Akron, Ohio • Ernest Jacoby and Company, Boston, Mass. • Herron & Meyer of Chicago, Chicago, Ill. • H. M. Royal, Inc., Los Angeles, Calif. • H. M. Royal, Inc., Trenton, N. J. • In Canada: St. Lawrence Chemical Company, Ltd., Montreal and Toronto



wire uniformity *to save you money!*

HERE at National-Standard we have realized for years how important wire uniformity is to the cost of your tire production. And so we have worked out many ideas to achieve a uniformity in wire size, strength and finish that smoothes out production, minimizes trouble and delay . . . and saves money!

Behind it all is the fact that National-Standard *specializes* in wire for tires and other rubber products . . . single wire, braid and tape, specially developed in many types, sizes, finishes or coatings for every known wire-in-rubber service. Here we *live* with the problems of tire bead cost, and with all the intricacies of wire application in rubber.

This adds up to a wealth of application experience and knowledge that you are welcome to draw on again and again. So please remember . . . you can always count on National-Standard for technical help, just as you can always count on National-Standard products for unsurpassed quality and money-saving uniformity.

NS
NATIONAL-STANDARD Company
NILES, MICHIGAN

DIVISIONS OF NATIONAL-STANDARD CO.

ATHENIA STEEL	*Clifton, N. J.*	**Flat, High Carbon, Cold Rolled Spring Steel**
NATIONAL-STANDARD	*Niles, Mich.*	**Tire Wire, Fabricated Braids and Tape**
WAGNER LITHO MACHINERY	*Jersey City, N. J.*	**Lithographing and Special Machinery**
WORCESTER WIRE WORKS	*Worcester, Mass.*	**Round Steel Wire, Small Sizes**

NOW! 5000V in 34"

NEW SMALLER G-E LIMITAMP AIR-BREAK CONTROLLER

Only 34 inches wide—including enclosure—as contrasted to the previous 52, yet capable of controlling 840 more volts—that's modern design exemplified in this new high-voltage control for motors up to 1250 horsepower.

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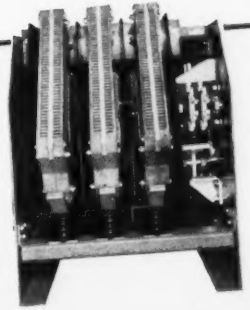

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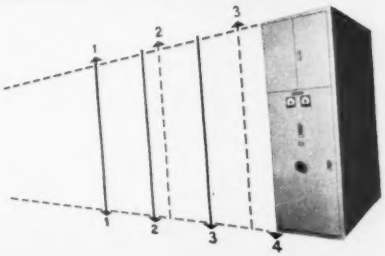

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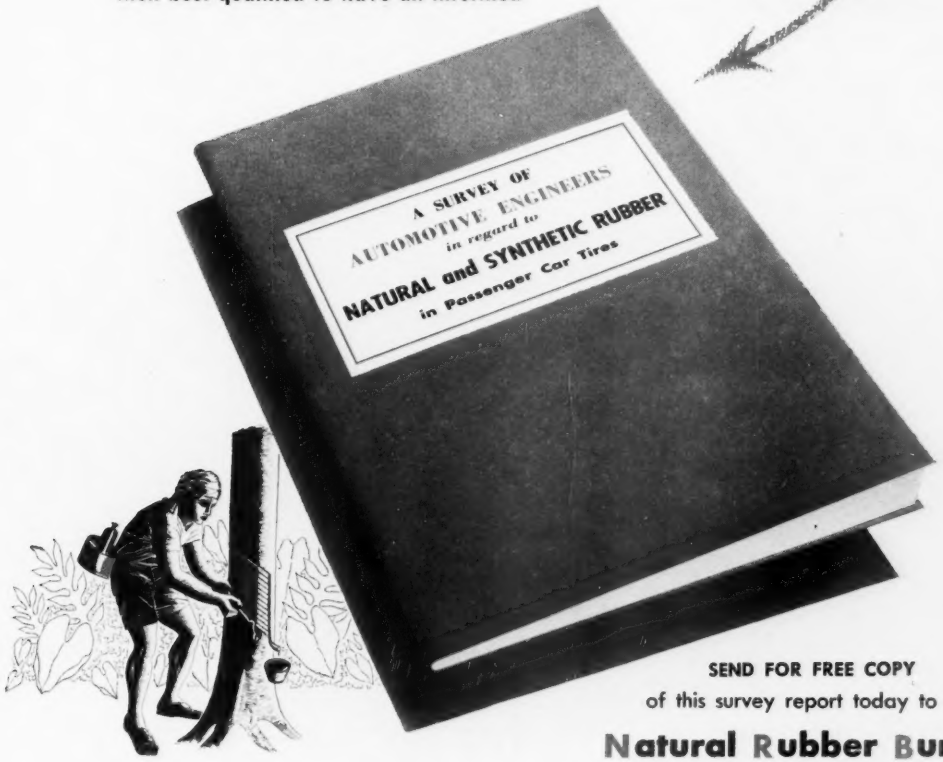

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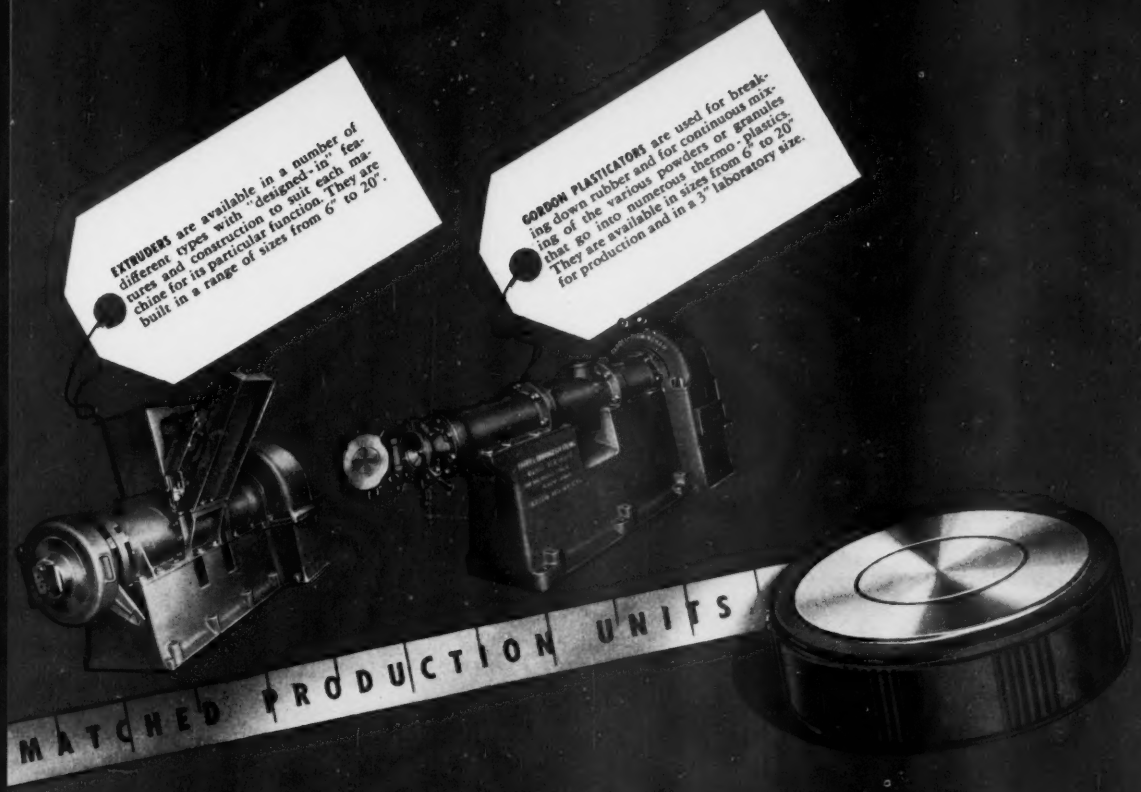
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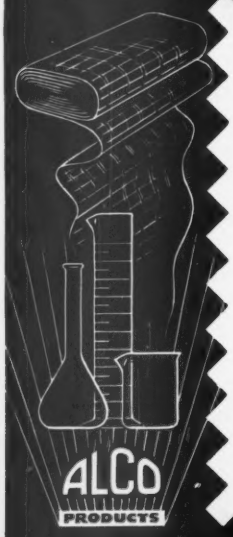

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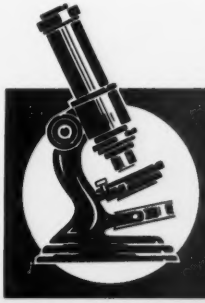

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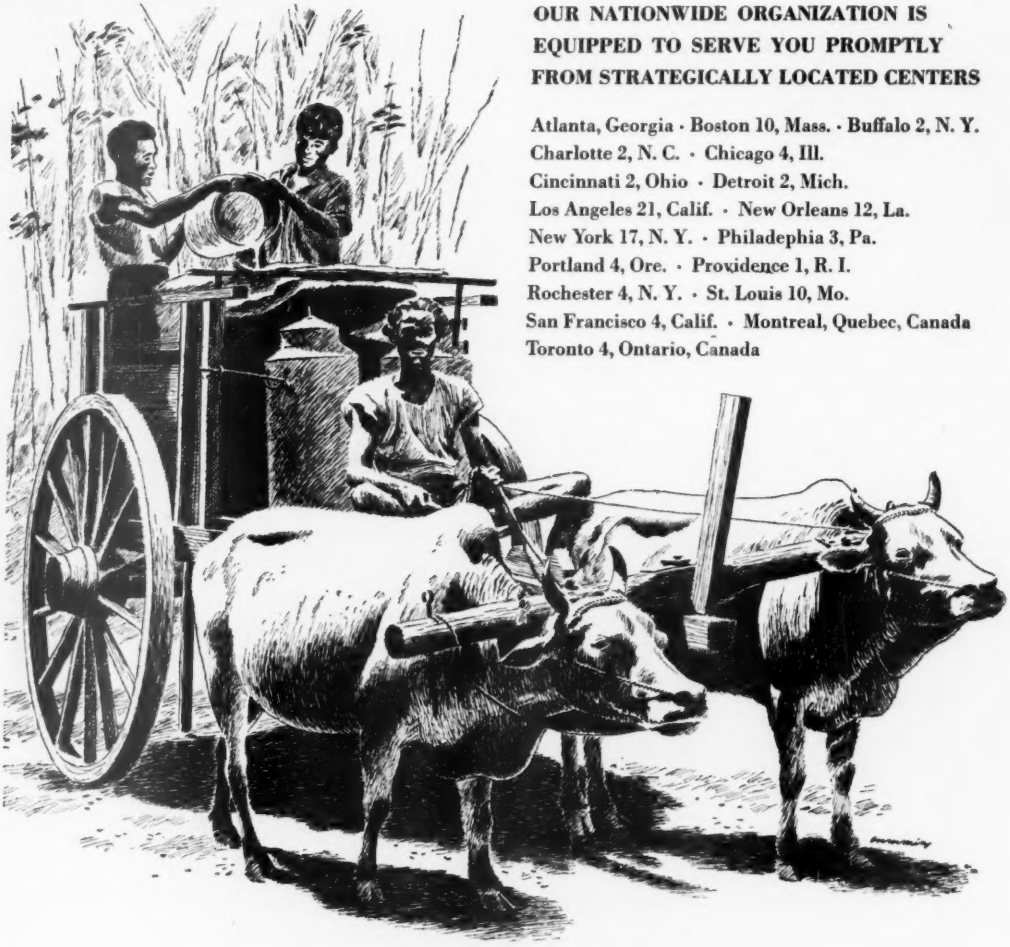

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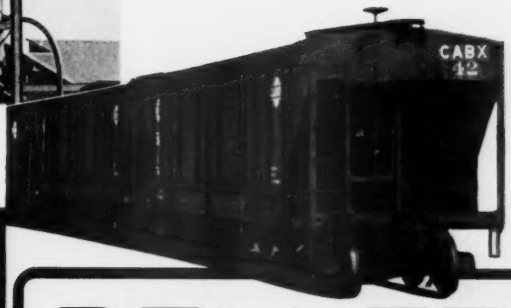

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RUBBER AGE

Vol. 67, No. 2 MAY, 1950

Composition and Structure of Colloidal Elastomers

By ERNST A. HAUSER

Professor of Colloid Chemistry, Massachusetts Institute of Technology, Cambridge, Mass., and Worcester Polytechnic Institute, Worcester, Mass.

IN his book, "History of the Peloponnesian War," the Athenian historian, Thucydides (460-399 B.C.), made the following statement: "Events shall, in accordance with human nature, repeat themselves at some future time—if not exactly the same, yet very similar." Although this quotation refers to the historical development of mankind, it is equally well applicable to the development of our knowledge in the field of elastic colloids. To offer factual proof for this opinion, all that is necessary is to scrutinize the literature pertaining to this subject.

In a paper which was published in 1896 *(3)* there occurs the following statement: "The elasticity of such substances as India rubber and gelatine was investigated. It was found that their elasticity bears no direct relation to the composition of the material, but is a matter of its configuration. It was shown that such substances consist of two or more compounds interpenetrating but not combining with one another. It was further shown that the heating on stretching, the cooling on relaxing, and the shortening when stretched and heated, followed as a natural consequence of the configuration."

Exactly thirty years later one of the leading rubber chemists of the United States wrote a paper on "Composition and Structure of Hevea Rubber" *(2)*. Therein is found the following statement: "Hauser also reports in private communication that he separates rubber purified absolutely free from protein by a refinement of Pummerer's method into two fractions, an ether soluble approximately 70 per cent and insoluble approximately 30 per cent. These two fractions cured separately give poor rubber. Together they are approximately equal to original. After standing, they reach a new equilibrium whereby the insoluble becomes partly soluble, and vice versa. The new rubbers are both equal to the original."

Two years later, two colloid chemists published a paper on the structure of rubber *(1)*. After reviewing all information then available and correlating the data obtained by straight-forward colloid chemical and X-ray diffraction analysis, they drew the following conclusions:

1. The properties of rubber are based on the presence of two substances of identical basic chemical composition, but differing in their degree of polymerization and exhibiting very different viscosities.

2. If rubber is subjected to tension the alpha part, which was dissolved in the beta part and had formed a lyogel, is separated from the latter (two-phase system).

3. Elongation of rubber causes a separation of the dissolved substance from its solvent.

At that time some other experimental proof had already been offered for the two-phase theory. By the use of a micro-manipulator it had been demonstrated that the individual rubber particles in the latex of *Hevea brasiliensis* are not of uniform consistency. By

Note: This paper is based on a lecture presented by the author in a course on "Recent Developments in Colloid Chemistry" sponsored by the Philadelphia Section, A.C.S., at the Philadelphia College of Pharmacy and Science at Philadelphia, Penna., on November 29, 1949.

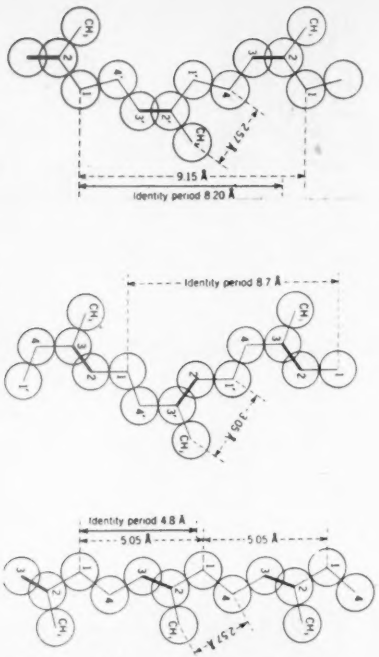

FIG. 1—Molecular chain models of natural elastomers stretched out flat. TOP: Natural rubber chain. CENTER: Alpha gutta-percha model. BOTTOM: Beta gutta-percha model.

the use of this technique it was possible to demonstrate that differentiation must be made between the very viscous substance in the interior of the latex particle and the elastic shell which surrounds it. Experiments to study the effect of solvents on the individual particle revealed that there is a difference in the solubility of the interior and the outer shell. It could be demonstrated that the outer shell is only slightly soluble and swells only very little in an organic solvent like benzene, whereas the internal phase of the particle is easily swollen and dissolved. In spite of all these findings the trend of research went more and more into the field of molecular kinetics and theories based entirely on very complex mathematics were evolved to explain the elasticity of natural rubber and synthetic elastomers.

Explanations of Rubber Elasticity

Elasticity was explained on the assumption that only matter composed of long-chain kinked or snarled up molecules can exhibit this property. The following quotations taken from recent publications are typical of the trend science has taken in attempting to explain the elasticity of rubber:

"The picture of the structure of rubbers on which Guth and James base their computations is as follows: masticated and uncured rubbers consist of a tangled mass of long-chain molecules, of which some may be linked together by a few chemical cross-bonds, while most can move more or less freely past each other, impeded only by the tendency of the Brownian motion to keep the chains tangled. The possibility of an unlimited relative displacement of the molecules is responsible for the flow of such elastomers, whereas the tangling of the chains keeps the internal viscosity high —the higher the longer the molecular chains and the stronger their mutual over-all attraction. If deformed rapidly and immediately released, they will return to their original shape almost instantaneously and with little plastic deformation because there has been time for only a little motion of the whole molecules with respect to each other.

"In the model of Guth and James the real molecular network is replaced by a similar network of idealized flexible chains, very irregular in detail but homogeneous and isotropic on the average and extending throughout the volume of the model. The space-filling properties of the real network are then introduced into the model by filling it with an incompressible fluid. Further refinements may be introduced by attributing to this fluid an appropriate compressibility and thermal expansion.

"It should be pointed out that not all individual macromolecules and not all parts of them will be involved actively in the network. A chain chemically attached to the network at one single point will not contribute to its tendency to pull against external forces. Such chains may be (and actually are to a certain extent) removable from the sample by solvents or, if connected into large and complicated snarls, may not be so easily separable from it. All these (inert) molecular chains will play just the role of a fluid extending through the material and thus appear adequately represented in the simplified model."

"It is very possible that the molecules as a whole cannot move themselves any more whereas certain atom groups still vibrate and swing to and fro. Under these circumstances we say in accordance with Kuhn's proposal that the macro-Brownian motion of the entire molecule is fixed but that the micro-B. m. of the single groups still is free.

"For the appearance of ideal rubber-like high elasticity, Kuhn has made the following two conditions: 1. The micro-B. m. of the thread molecules should be entirely free; 2. The macro-B. m. of the entire molecule should be prevented.

"The second condition is necessary, because in case of free macro-B. m. the chain molecules, while elongating, would flow away, thus destroying the disorder brought about artificially; the entropy-difference would disappear and consequently the cause of the recovery.

"In the liberty of the micro-B. m. and the prohibition of the macro-B. m. lies perhaps the briefest description of the requirements for the appearance of ideal high elasticity. On this basis it is easily understood why the existence of rubber-like elasticity is limited to a certain range of temperature. In lower temperatures, the micro-B. m. freezes in; the substance becomes stiff. Too high temperatures set the macro-B. m. free and the substance starts flowing. Here shows itself particularly the favorable action of bridges as formed during the building of nets, because these interlink the chains by primary bonds and therefore are not loosened by the increase of temperature.

"The above contemplations will make it clear that the nature of the secondary forces between the chain groups is decisive, whether at room temperature a substance possesses rubber-like properties or not."*(4)*—End of quotations.

When colloid chemists pointed out the undeniable fact that natural rubber is composed of isoprene present in different degrees of polymerization, this was either completely disregarded or considered to be of no sig-

nificance in explaining the property of elasticity of rubber-like compounds. To back up this opinion attention was drawn to the known fact that gutta-percha or balata, which exhibit no elasticity at room temperature, are also composed of polyisoprene and are therefore, chemically at least, identical with natural rubber. Their lack of elasticity was attributed exclusively to the difference in molecular structure of rubber and gutta-percha as had been worked out on the basis of X-ray diffraction studies. Rubber represents the *cis*-configuration of polyisoprene whereas gutta-percha or balata the *trans*-configuration *(11)* (Figure 1).

In contrast thereto colloid chemists could point out that elastic gels can also be achieved simply by adding to the colloid, whose particles can be either of the fibrillar or corpuscular type, a liquid of entirely different chemical composition but which will have the property of solvating the colloid. Dry gelatin, for example, is nonelastic; if the gelatin is soaked in water, however, so that it forms a gel due to the solvation of the gelatin molecules, it becomes elastic to a considerable extent. This phenomenon is even more pronounced with alkali silicates, gels obtained from certain types of clays, and some of the more recently developed silicone resins.

In a paper published in *Harper's Monthly*, September, 1875, Samuel John Stone (1839-1900) made the following statement: "What I can't see, I never will believe in!" How well this statement fits in with all attempts to explain the structure of colloidal elastomers was demonstrated only a few years ago. Electron photomicrographs of rubber which had been deposited from solution in an organic solvent onto a very fine wire screen offered the first visual proof for the two-phase theory of the structure of rubber. The electron photomicrographs showed that rubber is composed of liquid zones which are connected by solid bands and that the ratio of these liquid zones is dependent on the molecular weight distribution of the rubber under investigation *(5)* (Figure 2).

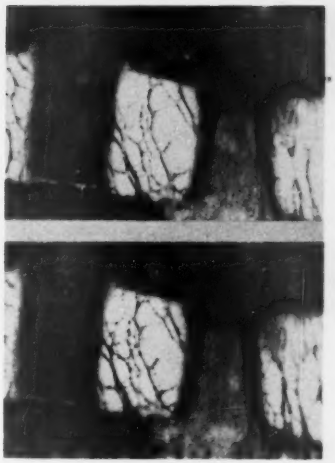

FIG. 3—Cryptostegia grandiflora rubber. TOP: Two hours after film deposition. BOTTOM: Twenty-seven hours after film deposition.

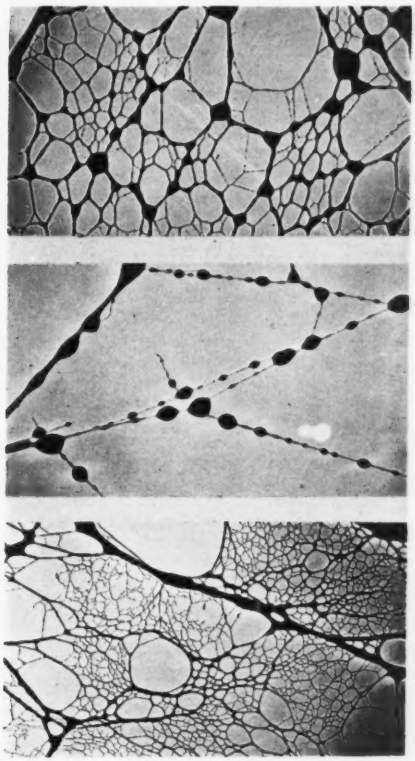

FIG. 2—Electron photomicrographs of natural rubber. TOP: Hevea rubber fibers (21,000 X). CENTER: Fibers from sol fraction of Hevea rubber (23,000 X). BOTTOM: Fibers from gel fraction of Hevea rubber (23,000 X).

Value of Ultramicroscope Techniques

Since rubber must be considered as a typical lyogel, the fact could not be disregarded that the morphology might have been affected by the high vacuum needed in the electron microscope and also by the electron bombardment to which the preparation must be exposed. This led to the development of an entirely new ultramicroscopic technique for studying elastomers *(6)*. It was soon discovered that the appearance of the liquid zones was not an instantaneous phenomenon but a time reaction (Figure 3). The film deposited on the wire screen will be under stress upon evaporation of the solvent. Knowing from X-ray diffraction studies of rubber that stress causes alignment of the long-chain molecules, it is concluded that the formation of the liquid zones is due to synaeresis *(7)*. This becomes even more evident when the preparation is heated, because then the reaction is speeded up tremendously *(8)* (Figure 4).

If a low molecular weight fraction of rubber which is not elastic but only sticky is deposited on the screen, the film collapses immediately, whereas the film deposited from a high molecular weight fraction, which by itself also is not elastic, reveals only bands, or filaments, after the solvent has evaporated. However, by mixing the fractions in appropriate proportions prior to spreading, a highly elastic film resulted which upon evaporation

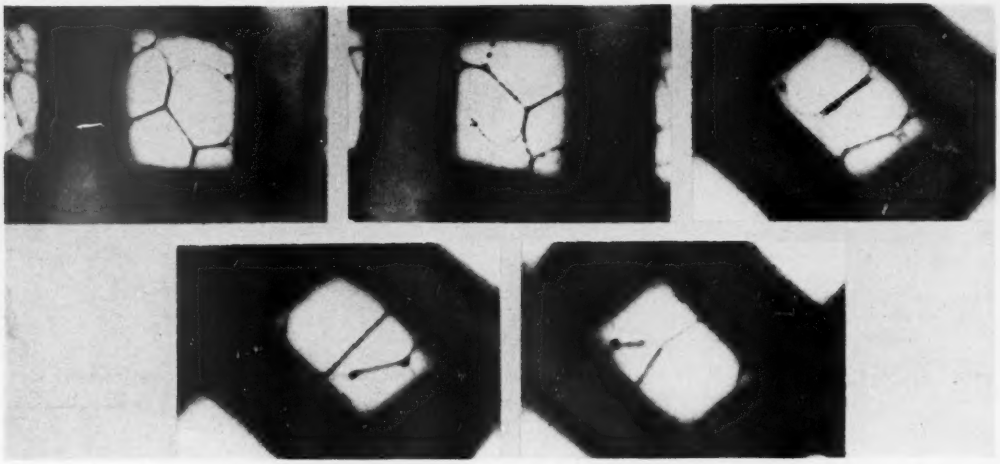

FIG. 4—Cryptostegia grandiflora rubber deposited at elevated temperatures. TOP - LEFT: 40° C., 1 hour after deposition. CENTER: 40° C., 2 hours after deposition. RIGHT: 50° C., immediately after deposition. BOTTOM - LEFT: 50° C., 10 minutes after deposition. RIGHT: 50° C., 15 minutes after deposition.

FIG. 5—Gutta-percha deposited at room temperature.

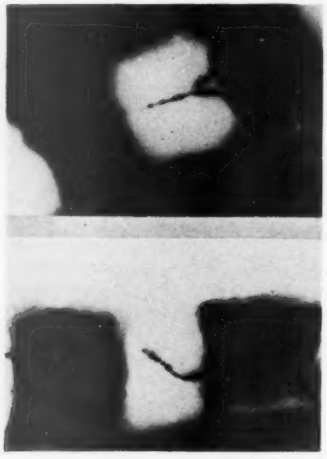

FIG. 6—Gutta-percha deposited at elevated temperatures. TOP: Heated to 65° C. BOTTOM: Heated to 70° C. and cooled immediately after break.

of the solvent again revealed the formation of globules and fine threads.

Perhaps even more enlightening than the study of natural rubber is that of gutta-percha. Ultramicroscopic studies of total gutta-percha reveal that films deposited at room temperature yield irregular structures with ragged edges *(7)* (Figure 5). However, if these films are heated under the microscope to 65° C., the formation of liquid zones becomes immediately evident *(8)* (Figure 6). At this temperature gutta-percha exhibits pronounced elasticity.

Polychloroprene also crystallizes in the *trans*-configuration; therefore, its molecular structure and its morphology, as well as its properties, should correspond to those obtained from gutta-percha and not to those obtained from rubber. It is well known, however, that neoprene is much more elastic than gutta-percha, even at room temperature. Ultramicroscopic studies immediately revealed the formation of globules *(7)* (Figure 7). From a colloid chemical point of view this is not astounding, because colloid chemistry must take into consideration not only the chemical composition but also the morphology. The reason for this discrepancy is due to the fact that the chlorine atom is farther removed from the hydrocarbon chain than the methyl group in gutta-percha. Thus, chain bond rotation and molecular oscillation are facilitated, permitting a greater freedom of movement which results in unhindered molecular alignment and synaeresis of the low molecular weight fraction.

To prove how this technique will add to our knowledge of the influence of molecular size on the flow and the general morphological aspects of a polymer, polyisobutylene was chosen, because it is chemically highly stable and changes in morphology due to oxidation can therefore be discounted. Polyisobutylene of low molecular weight gives films of little strength which show great flow and break very easily. Polyisobutylene of an average molecular weight shows very fine but strongly netted films. Polyisobutylene of high molecular weight shows strong bands and some netting. When studying the morphology of predetermined mixtures of

very high as well as very low molecular weight fractions, netting disappears completely and only very fine threads studded with bead-like globules can be observed. In their morphology they approach now the pictures obtained from natural rubber. At the same time the elastic properties of so-synthesized polyisobutylene approaches that of the natural rubber just referred to *(8)* (Figure 8).

Experiments with butyl rubber, the copolymer of isobutylene and a diolefin, were carried out with five samples differing only in the amount of diolefin they contained *(8)*. The samples with the lowest percentage of diolefin compared in their morphology to the lower molecular weight samples of Vistanex or isobutylene. They did show, however, a far more pronounced globule formation than the polyisobutylene by itself (Figure 9). If these results are compared with those obtained from compounds of these polymers, it becomes quite evident that the molecular weight distribution of an elastomer is of primary importance for its mechanical properties.

A series of molecular weight fractions of polystyrene were also subjected to investigation *(9)*. In general, only single threads can be observed, although the higher molecular weight fractions indicate at least a tendency for netting. No change in the morphology of the preparations could be observed up to temperatures as high as 95° C. If a mixture is prepared, however, which contains 75 per cent of an 8,000 MW fraction and 25 per cent of a 250,000 MW fraction, and a film is deposited therefrom and heated to a temperature of 90° C., the formation of globules becomes clearly evident. This demonstrates beyond any question of a doubt that globule formation is the result of a polydisperse system, besides the fact that the facility of globule formation also depends on the configuration and the temperature to which the preparation is subjected.

In one of his lectures, Martin H. Fischer, Professor of Physiology at the University of Cincinnati, made the following remark: "Colloid chemistry is the twilight between chemistry and physics—but that is where God has chosen to reveal himself." Any unbiased scientist must admit that there is lots of truth in this statement, and since God has chosen to reveal himself primarily in nature, the method by which it produces elastomers deserves more attention than it has received so far.

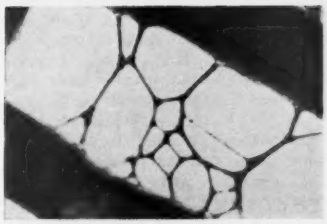

FIG. 7 — Polychloroprene (Neoprene).

The following quotation is the best up-to-date summary of our knowledge on this subject: "On the basis of all observations so far described in literature, the following hypothesis about the formation of the rubber hydrocarbon has been set up. Within the protoplasm of the rubber latex vessels, small globules of different diameters are formed consisting of a unit of low molecular weight. Upon tapping the tree, because of the strong current of latex through the system of narrow vessels, the globules take on their remarkable nonspherical shape. Afterwards this form is fixed by polymerization which is initiated on the surface of the particles under the influence of catalysts dissolved in the serum, oxygen and light probably also playing a part. The further polymerization into the interior of the particles will take place at a comparatively slow rate. The connection between the size of the particles and the degree of

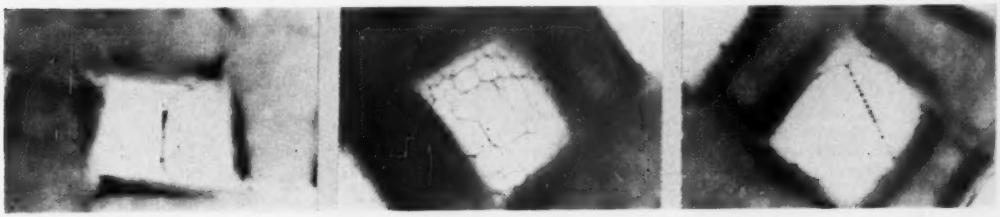

FIG. 8—Polyisobutylene. LEFT: Standard product. CENTER: Mixture in the ratio of 10:90 of molecular weight fractions of 40,000 and 300,000. RIGHT: Same mixture but in reversed proportions of molecular weight fractions.

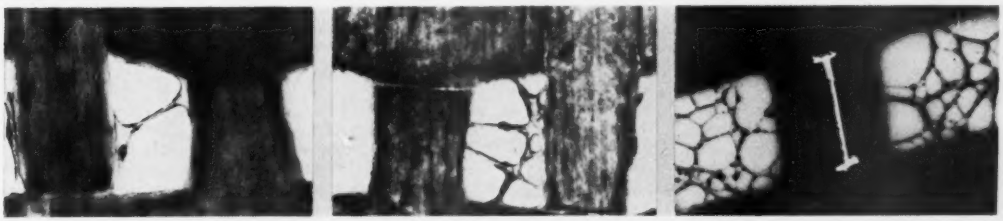

FIG. 9—Butyl rubber. LEFT: Butyl 8. CENTER: Butyl 3.5. RIGHT: Butyl 0.5.

polymerization could be explained by the fact that small particles have a larger surface in comparison to their volume than large particles, whereby the velocity of polymerization would be greater and shorter chains would be formed than with larger particles." *(10)*.

During World War II we had to depend exclusively on synthetic rubber. We had to act quickly and there was no time for systematic research. The polymerization of the monomers was not carried out in bulk but in the form of emulsions. Here again we had to rely on what colloid chemistry has taught us. We were successful and we can really be proud of our accomplishments. However, as scientists, we should admit with equal frankness that even today we are still far from being entitled to claim that we have produced a synthetic elastomer which is comparable to natural rubber in *all* its properties.

The development of so-called "cold GR-S" synthetic rubber must be considered an important step in this direction. Although we should frankly admit that we owe this development to German colloid chemists, just as we did the emulsion polymerization of butadiene and styrene to form a copolymer, we should also admit that German chemistry had realized even before we entered into World War II that a decrease in the temperature of polymerization would result in a better molecular weight distribution in the formed polymer particles. Even this improvement, however, is not yet a fully satisfactory answer. Therefore it is high time that those responsible for our nation's future take cognizance of this fact and have those in charge of the production of synthetic elastomers pay more attention to the colloidal phenomena involved.

What we must drive at is not so much to learn how we can synthesize a rubber-like material from isoprene, but how we can produce a synthetic latex, the particles of which have a morphology comparable to that of the natural product. This means that we must learn how to produce an emulsion whose particles are of a size comparable to the dimensions of the particles in the natural product. Since the particles in the natural product are larger on the average than those in the synthetic emulsion, the hydrocarbon-water interface in the natural latex is proportionally smaller. This means that the amount of emulsifying agent or protective colloid needed to produce a stable emulsion is smaller. Furthermore, a reduction in the amount of protective colloid, if we may call it so, will also reduce the amount of coagulating agent needed to cause the rubber to gel.

Above all, however, the larger particle size will have another highly important effect; polymerization will start at the interface between the monomer droplets and the dispersion medium, thereby causing the surface layer of the droplet to polymerize before the reaction can proceed by diffusion to the interior. The net result will be a particle comparable in its morphology to the natural product, and therefore the hydrocarbon which shall then be available will be of a molecular weight distribution comparable to the natural product.

Tests made with synthetic elastomers obtained by low temperature emulsion polymerization and with the properties just outlined have already offered definite proof that such a procedure will lead to synthetic elastomers exhibiting properties superior to those now available.

To reach this goal on a production scale needed by our nation calls for a cooperative effort of our organic chemists, colloid chemists and chemical engineers and those who can estimate well in advance which of our natural resources would be available in sufficient quantities without curtailing their use for other essentials.

This year the bicentennial of Johann Wolfgang von Goethe's birth is celebrated all over the earth. It therefore seems only appropriate to close this lecture on the composition and structure of colloidal elastomers with the following quotation taken from his autobiography: "The sagacious reader who is capable of reading between these lines what does not stand written in them, but is nevertheless implied, will be able to form some conception."

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Technique for Applying Insulation to Cylindrical Ducting

THE Industrial Mineral Wool Institute offers a simple technique for applying insulation to cylindrical ducting. These units are often difficult to insulate because they are too large for pre-formed pipe insulation, the nature of the ducting prohibits the use of bolts, screws, or wires which puncture the duct surface, and the curvature of the surface is too great to permit insulation to be temporarily stuck in place prior to strapping.

One company easily solves the problem of insulating its high temperature duct leading to an exhaust fan this way:

(1) Dirt, grease, and other extraneous material is cleaned from the surface of the duct with a wire brush.

(2) Eight-inch lengths of galvanized wire are spot welded to the surface of the duct.

(3) One-inch thick mineral wool blankets, supplied sandwiched between expanded metal lathe and light-gauge galvanized wire mesh, are impaled on the projecting wires. The expanded lathe faces out and the protruding galvanized wires are bent over to hold the insulation in place.

(4) The sections of blanketing are laced together at the edges by galvanized wires intwined in the lathe.

(5) Finally, the blanket is covered with a one-half-inch layer of mineral wool insulating cement trowelled over the surface of the expanded metal lathe.

Although this particular job is to prevent excessive heat from radiating into the plant and making work areas uncomfortable for operating personnel, similar installations are often valuable fuel savers.

C. I. C. Rubber Division Meets in Toronto on June 21

A MEETING of the Rubber Division of the Chemical Institute of Canada will be held in Toronto, Ontario, on Wednesday, June 21. The meeting is being held in conjunction with the 33rd Canadian Chemical Conference and Exhibition, now sponsored by the C.I.C. The Division meeting will feature the presentation of eight technical papers. A business meeting will also be held which will feature the election of officers. All sessions of the Division will be held at the Royal York Hotel. N. W. Smith, of the Latex and Reclaim Division, Dominion Rubber Co., Ltd., Montreal, Canada, is secretary-treasurer of the Division. Titles, authors and abstracts of the scheduled papers follow:

ABSTRACTS OF PAPERS

A Study of Styrene-Butadiene Copolymers. ***E. B. Storey and H. Leverne Williams (Polymer Corp., Ltd., Sarnia, Ont., Canada).***

It is well known that copolymers of butadiene and styrene may be prepared in which the ratio of the two components may be varied. Copolymers rich in butadiene are soft elastomers whereas those rich in styrene are rubbery resins. Blends of these two types of materials find considerable use in mechanical goods, shoe soling, floor tiling, and other products.

As the amount of styrene in the polymer is increased the product is vulcanizable and yields test pieces with decreasing tensile strength and elongation and increasing modulus. When the copolymer is prepared from a 30/70 butadiene/styrene charge the test strips may no longer be flexed and when the charge ratio is 20/80 meaningful test results cannot be obtained and the product resembles ebony. Interesting trends in various properties were noted with these polymers and blends of these with GR-S.

Blends of such polymers were prepared with GR-S using the technique of blending in latex form prior to coagulation. The properties of such blends were at least as good as those of mill blended mixtures. Two types of studies were undertaken. The first indicated that within fairly broad limits the properties of the blends were fixed by the total styrene content rather than by the polymers mixed to achieve that end. The other series indicated that certain differences arose when the materials were blended in constant proportion without regard to total styrene content.

Postwar Review of USF Rubber. ***J. McGavack (U. S. Rubber Co., Passaic, N. J.).***

This is a postwar review of USF rubber, a rubber designed to satisfy the demand of consumers for a superior type of material. The more important characteristics of this rubber are: extreme cleanliness, softness, light color, uniformity of composition, high resistance to flex cracking, and uniformity in cure. This paper describes briefly the process by which such a rubber is manufactured, giving results on pilot plant production carried out in the last two years. The text is supported by a motion picture of the process used to prepare this rubber.

The Practical Application of Research Ideas in Development of New Polymers. ***T. L. Davies (Polymer Corp., Ltd., Sarnia, Ont., Canada).***

New developments in the field of polymerization catalysts permit, for the first time, the production of "cold" butadiene-acrylonitrile oil-resistant polymers with improved physical properties.

A better understanding of the factors affecting the properties of rubber polymers at low temperatures indicates the possibility of designing better rubber articles for such service.

The successful application of latex or liquid preblending of the major components of a leather substitute soling compound to eliminate mixing and physical property variations opens up other possibilities in latex masterbatching.

The development of high Mooney butyl rubber, with its greater plasticizer tolerance, makes the production of superior age-resistant mechanical goods economically feasible.

Low Temperature Rubber. ***By an Author of the Firestone Tire & Rubber Co., Akron, Ohio.***

No abstract available.

Effect of Mechanical Aggregation on the Dispersion Characteristics of Carbon Black. ***E. M. Dannenberg and C. A. Stokes (Godfrey L. Cabot, Inc., Boston, Mass.).***

One of the most important operations in the manufacture of carbon black for the rubber industry is the densification and pelletization of the low bulk density fluffy products produced by both the channel and furnace processes. From an initial bulk density of only three pounds per cubic foot, modern techniques of densification will produce a product of over twenty pounds per cubic foot. Carbon black in such a highly densified and beaded form minimizes the problem of dustiness and facilitates the factory handling of large quantities in automatic conveyor systems.

It has been observed that the degree of mechanical aggregation required to produce this densification of carbon black has little influence on its performance in natural and most of the synthetic rubbers. This is not the case when pelletized carbon blacks are used in the preparation of inks and paints. In these applications satisfactory dispersion may not be obtained with the highly aggregated forms of carbon black.

This paper discusses the influence of mechanical aggregation on the dispersion characteristics of carbon blacks. In natural rubber and GR-S high shearing forces necessary for the disintegration and dispersion of the carbon aggregates are developed during mixing, and in these systems the effect of moderate mechanical aggregation is small. The process of mixing other types of systems may not develop the high shearing forces to properly disperse some pelletized forms of carbon black. In relatively low viscosity media, such as water, oils, and highly plastic polymers, large differences are observed in dispersion with variations in the bulk density of carbon blacks.

The Measurement of Strains in Tires. ***D. L. Loughborough, J. M. Davies, and G. E. Monfore (B. F. Goodrich Co., Akron, Ohio).***

Because of obvious complications it is too difficult to calculate the stresses in the cords of a tire. In this work the direct measurement of strain was undertaken. Two techniques are discussed: (1) the measure of the increase in length of the cords in the outside ply, and (2) a radiographic technique in which the change in length of the cord elements, marked by steel wires, is followed by photographic methods. The measurements on a number of tires are presented.

The cords in a tire are strained about 2% by the inflation pressure. When the tire is loaded some of the cords are thrown into compression and some into more tension. During the rotation of the tire the cords are thus subjected to a vigorous alternation of compression and tension (±2%). At the same time the angles between the cords change by as much as two degrees.

A few general applications are mentioned and their importance to the tire engineer is indicated.

The Vulcanization of Neoprene. ***A. M. Neal (E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.).***

Neoprene, unlike natural rubber or any of the other synthetic rubbers, is capable of being vulcanized without the addition of any curing agents or accelerators. For practical vulcanizates, however, metallic oxides—normally combinations of zinc oxide and magnesium oxide—are always employed as curatives and for some applications, additional accelerators have proven desirable. This paper describes the experimental work which has resulted in the development of a new accelerator for neoprene vulcanizates. This new accelerator, *2* mercapto-imidazoline, enables the compounder to produce stocks having a very rapid rate of cure while maintaining the processing safety required to insure satisfactory factory operation.

Tests are reported on vulcanizates from both Neoprene Type GN and Neoprene Type W. With both types of neoprene, the stocks are characterized by superior resistance to deterioration on aging, a high state of cure, outstanding resilience, and excellent resistance to compression set. The magnitude of compression set values ordinarily increases markedly with increases in the temperature at which the compression is imposed. Data are presented which show that with vulcanizates of Neoprene Type W prepared using *2* mercapto-imidazoline as the accelerator the increase in set values as the imposed temperature increases from 70-120°C. is slight. Such stocks are superior to even the best "low set" natural rubber vulcanizates.

Butadiene-Styrene Resinous Copolymers. ***J. D. D'Ianni, L. D. Hess, and W. C. Mast (Goodyear Tire & Rubber Co., Akron, Ohio).***

In recent years, resinous copolymers of butadiene and styrene have become of great commercial importance and have to a certain extent supplanted chemical derivatives of rubber which could not be made during the war. In addition, promising new applications have been developed which are expected to widen greatly the uses of these interesting resins.

Polymerization studies on butadiene-styrene systems containing up to 50% styrene are reported. With increasing proportion of styrene, the rate of polymerization is increased and less modifier is required. Properties of latices stabilized with different types of emulsifiers are discussed. The composition and physical properties of the copolymers are described in detail, with particular emphasis on the effects of varying the butadiene-styrene ratio.

The technical literature on the rubber compounding and applications of these resins is reviewed. Particular emphasis is given to their use in rubber reinforcement and impact-resistant blends, in solution applications for protective coatings and paper coatings, and in latex applications such as compounding with rubber latices and in emulsion paints.

Some Recent Applications of Expanded Rubbers

ACCORDING to a paper on "Applications of Expanded Plastics," given by Dr. Howard R. Moore, of the U. S. Naval Air Development Center, at the recent Plastics Seminar in Washington, D. C., sponsored by the Society of the Plastics Industry, practically every type of thermoplastic and thermosetting resin has been successfully foamed. Only five types, however, are being produced commercially at this time including, in the probable order of industrial production, sponge rubbers and other elastomers, polystyrenes, phenolics, ureas and vinyls. Dr. Moore's paper was basically devoted to the possible application of these materials in radomes, and the following is that portion of the talk devoted to the various rubbers.

The open-cell non-rigid sponge rubbers are obviously unsuitable as core material for all types of microwave radomes. This type comprises by far the largest quantity of expanded rubber, since it is estimated that well over 200,000 tons have been produced annually since the close of the war. Chemically blown sponge of this type is widely used for upholstery, mattresses, train and bus seats, and in the automotive industry for weatherseals, seat cushion pads and vibration dampeners. There are indications, however, that this grade is being replaced by the closed-cell non-rigid type for gaskets and seals in the automotive industry. The closed-cell types are particularly noted for their resistance to moisture and water penetration, which makes them attractive for use in the fields of refrigeration, flotation and buoyancy.

The closed-cell rigid Hycar types were used extensively during the war for radomes and are continuing their peacetime uses in the fields of refrigeration, aeroplane fuselage, life net floats and other applications requiring uniform performance over a wide temperature range. The Virginia Rubatex Division of Great American Industries is currently manufacturing an insulation grade having an average density of 4.8 lb. per cu. ft. and softening temperature of 140° F., although heavier grades are available with softening temperatures of 200° and 300° F. Aside from fabrication difficulties, these types might be of distinct interest for radomes, especially if it should be found possible to substitute a reinforced rubber composition for the Fiberglas skins now used.

The U. S. Rubber Co., is also active in this field with its recent announcement of four expanded Royalite rubbers made from copolymers of styrene and butadiene with acrylonitrile. These foams have good mechanical properties and excellent water and petrol resistance, and are undoubtedly satisfactory for use in pontoon floats, anchorage buoys, soundproofing installations, and for general structural uses. It is expected that they can be used satisfactorily in radomes, except where high surface temperatures are a factor. These materials have heat distortion points ranging from 94° to 131° F.

An interesting development which warrants further attention is the process developed by the Sponge Rubber Products Co. during the war, in collaboration with U. S. Plywood Corporation, for converting soft precured Hycar rubber to the rigid state in typical Fiberglas assemblies by heating without pressure for 2½ hours at 290° to 300° F. Satisfactory adhesives apparently were found for cementing the hardened cores to Fiberglas skins. Sponge rubber formulators should be urged to consider further the possibilities of developing mastic rubber compositions or other elastomers capable of subsequent expansion after placement in molds to form rigid cellular foams from this or analogous processes. It is conceivable that such materials and methods will give the desired physical properties and uniformity in density throughout the radome, and at the same time furnish a rapid production technique.

Certain grades of cellular hard rubber are being successfully used by Hamilton Standard Propellers and other manufacturers of hollow steel propeller blades. However, the high gas pressures generated by the expanding rubber foams must be counteracted by restraining dies contoured to the same shape as the propeller blades. These dies are very expensive and tedious to make. For this reason, propeller blade manufacturers are turning their attention to more suitable foaming-in-place compositions which expand by virtue of a chemical condensation reaction, like the alkyd di-isocyanate foams.

2-Benzothiazyl-N,N-Disubstituted Thiocarbamyl Sulfides as Vulcanization Accelerators

By G. M. WOLF and C. C. de HILSTER

Research Laboratories, Sharples Chemicals Inc., Wyandotte, Mich.

Benzothiazoles and thiuram sulfides represent two classes of vulcanization accelerators which have been widely and advantageously employed in the rubber industry for many years. The essential structure of each of these two classes of accelerators may be incorporated in a single molecular form, the simplest representatives of which are the 2-benzothiazyl-N,N-disubstituted thiocarbamyl sulfides. These have the structure represented by R-S-C-NR′R″ where R is a benzothiazyl group, and -NR′R″ is a secondary amino group. A compounding survey of this class of compounds has shown them to be powerful vulcanization accelerators exhibiting a desirable delayed action. Vulcanizates have been prepared with these materials in natural rubber, GR-S, GR-A and GR-I.

The 2-benzothiazyl-N,N-disubstituted thiocarbamyl sulfides disperse readily in natural rubber and GR-S, where they function as primary self-activated accelerators. Small amounts afford effective vulcanization, producing vulcanizates with good stress-strain properties, tear and cut-growth resistance, and good aging characteristics.

A number of the 2-benzothiazyl-N,N-disubstituted thiocarbamyl sulfides, such as, the N,N-dimethyl, -diethyl, -dibutyl, N-ethyl-N-phenyl, and N-cyclopentamethylene derivatives have been investigated in natural rubber and GR-S. The N,N-diethyl derivative, one of the most active of the group, has been more thoroughly studied in natural rubber, gum and tread stocks, as well as in GR-S tread stocks. Vulcanizates cured with 2-mercaptobenzothiazole and N-cyclohexyl-2-benzothiazyl sulfenamide are included for comparative purposes.

THE use of the benzothiazoles and their derivatives as well as the thiuram sulfides have been thoroughly investigated as primary vulcanization accelerators for both natural and synthetic rubbers. Since 1921 when Bedford and Sebrell *(1)* in the United States and independently Bruni and Romani *(3)* in Italy disclosed the use of mercaptobenzothiazole as a powerful vulcanization accelerator, a great variety of related compounds and numerous derivatives have been prepared, patented, and evaluated. Many attempts have been made to synthesize mercaptobenzothiazole derivatives possessing desirable delayed action characteristics. Harman *(5)* has reported on the vulcanization characteristics of several mercaptobenzothiazyl derivatives having delayed action.

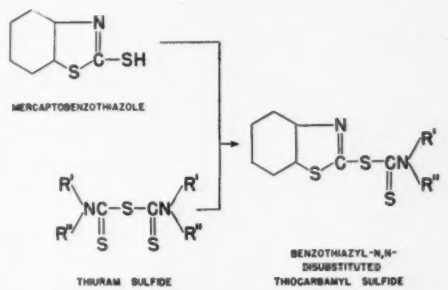
Ostromislensky *(9)*, Maximoff *(7)*, Bruni *(2)*, and Romani *(11)*, studied the dithiocarbamates, and their oxidation products, the thiuram disulfides, these being some of the oldest of our organic accelerators. In the United States Cadwell *(4)* and Molony *(8)* in a series of patents disclosed the use of thiuram derivatives as vulcanization accelerators. Like the benzothiazoles, the thiurams have been investigated for many applications in rubber stocks during the past thirty years.

The intense interest in these two types of accelerators is illustrated by the number of patents which have been granted. In the United States alone, from the period of 1915 to 1940, 106 patents *(12)* have claimed mercaptobenzothiazole, its derivatives, reaction products and analogues. In a like period 55 United States patents have been issued on the dithiocarbamates and thiuram sulfides.

Until the second World War nearly all these studies were directed toward the use of these accelerators in natural rubber. However, with the increased use of synthetic rubber, particularly the 1,3-butadiene copolymers, more thorough and better organized evaluation programs were conducted on these same accelerators. Vila *(15)* and Lawrence *(6)* were among the contributors who studied the compounding characteristics of these accelerators in GR-S (Buna-S) during the early stages of the war.

In many of these investigations, the all important question of sulfur-accelerator ratio and its effect on the physical properties of the vulcanizate for a specific end use has been carefully considered. In many cases the co-use of both types of accelerator has been found advantageous. Among others, Robinson Bros., Ltd. *(10)*, issued a laboratory report on physical combinations of thiazoles with dithiocarbamates and thiurams.

However, no compounding study employing a *single* molecular entity containing both the benzothiazole and the thiuram sulfide structures has been reported. Such a molecular type is represented by the 2-benzothiazyl-N,N-disubstituted thiocarbamyl sulfides of the formula R-S-C(S)-NR′R″, wherein R is a benzothiazyl group and -NR′R″ is a secondary amino group. Actually this is the simplest possible molecular structure embodying the combination of a mercaptobenzothiazole and a thiuram sulfide which still retains the -NCSS- linkage in each of the component units.



Note: This paper was presented before the meeting of the Division of Rubber Chemistry, A.C.S., New York, N. Y., September, 1947.

The patent literature discloses that ter Horst *(14)* describes a process which results in the preparation of this type of compound as well as their use as vulcanization accelerators. Teppema *(13)* also conducted experiments with these compounds.

The present investigation was undertaken to determine what effect this composite type of organic accelerator would have on properties of fundamental importance in various types of rubbers.

Comparison of Secondary Amino Group

Several members of the 2-benzothiazyl-N,N-disubstituted thiocarbamyl sulfide class of accelerators were investigated in both natural rubber and GR-S. Varying the secondary amino group brings about corresponding variations in the degree of accelerator activity. The physical properties of the compounds investigated are as follows:

2-Benzothiazyl-N,N-Disubstituted Thiocarbamyl Sulfide	Appearance	Melting Point, ° C.
-N-Cyclopentamethylene	Light yellow powder	133-137
-N,N-Dimethyl	Light yellow powder	106-112
-N,N-Diethyl	Light yellow powder	77-78
-N,N-Dibutyl	Brown viscous liquid	.....
-N-Ethyl-N-phenyl	Light yellow powder	105-108

In the processing of both natural and synthetic rubbers the low melting points of nearly all of these compounds definitely favor good dispersibility and consequent uniform vulcanization. Very early in the investigation it was observed that these compounds were very effective and powerful primary accelerators having marked capacity for self-activation, hence the adjustment of accelerator content was an important factor.

For the investigation of the effect of changes in the secondary amino group of this series of accelerators base recipes of the following compositions were selected for natural rubber and GR-S:

Natural Rubber	
Pale Crepe	100.0
Stearic Acid	1.0
Zinc Oxide	10.0
Sulfur	2.5
Accelerator	0.3

GR-S	
GR-S	100.0
Asphaltic flux softener	5.0
Zinc Oxide	5.0
EPC Black	50.0
Sulfur	2.0
Accelerator	0.75

The milling, curing, and testing procedures commonly employed for similar types of stocks were followed with only slight changes. A large master batch containing all the compounding ingredients except the accelerator was prepared, split, and used for testing. The GR-S stocks, after the addition of the accelerator, were allowed to rest 24 hours, were then refined by two passes through a tight mill and sheeted to the desired thickness before curing.

The following physical testing procedures were employed in all of this work:

Scorch values were obtained on a T-50 specimen stretched to 200% elongation and so maintained for 15 minutes. The percentage recovery was taken 5 minutes after the release of tension. This method of illustrating scorch is particularly adaptable to natural rubber stocks in which a graphical presentation can be easily comprehended. In the case of the GR-S

TABLE I—EFFECT OF VARIATION IN SECONDARY AMINO GROUP OF 2-BENZOTHIAZYL-N,N-DISUBSTITUTED THIOCARBAMYL SULFIDES ON PHYSICAL PROPERTIES IMPARTED TO PURE GUM NATURAL RUBBER VULCANIZATES.

Secondary Amino Group	Cure at 274° F., Min.	Modulus at 300%, lb./sq. in.	Modulus at 500%, lb./sq. in.	Tensile Strength, lb./sq. in.	Elongation, %	T-50, ° C.
N-Cyclo-pentamethylene	10	220	590	3290	710	— 0.2
	15	210	650	3600	700	— 9.3
	30	250	710	3690	700	—18.7
	45	250	620	3200	700	—20.8
N,N-Dimethyl	10	150	350	2500	720	+ 3.5
	15	220	580	3300	710	— 6.4
	30	230	570	3350	710	—18.0
	45	200	530	3400	710	—20.6
N,N-Diethyl	10	50	100	700	800	+11.3
	15	200	550	3300	710	— 3.0
	30	210	600	3520	720	—20.2
	45	200	550	3290	710	—22.6
N,N-Dibutyl	10	50	120	140	590	+ 8.9
	15	100	300	2190	770	+ 4.0
	30	200	510	3450	730	—12.5
	45	200	550	3220	740	—18.5
N-Ethyl-N-phenyl	10			No Cure		
	15	100	170	1100	750	+12.0
	30	210	550	3480	740	—12.0
	45	200	490	3320	730	—18.3
Tetraethyl-thiuram disulfide	10	190	550	3180	700	— 4.0
	15	200	680	3710	700	—12.3
	30	180	430	3400	730	—21.7
	45	150	450	3100	720	—27.7
2,2'-Dibenzothiazyl Disulfide [a]	10			No Cure		
	15			No Cure		
	30	120	200	2020	770	+ 8.7
	45	170	390	2950	750	— 3.6

[a] 1.0 part 2,2'-dibenzothiazyl disulfide was used.

TABLE II—EFFECT OF VARIATION IN SECONDARY AMINO GROUP OF 2-BENZOTHIAZYL-N,N-DISUBSTITUTED THIOCARBAMYL SULFIDES ON SCORCH CHARACTERISTICS AND PHYSICAL PROPERTIES IMPARTED TO GR-S VULCANIZATES.

	Scorch Data			Original Physical Properties								
Secondary Amino Group	Cure at 240° F., Min.	Tensile Strength, lb./sq. in.	Elongation, %	Cure at 280° F., Min.	Modulus at 300%, lb./sq. in.	Tensile Strength, lb./sq. in.	Elongation, %	Tear Resistance, lb./in.	Hysteresis, ΔT° F [a]	Resilience (Lüpke), %	Compression Set, %	Flex-Life [b]
N-Cyclopentamethylene	120	under cure		45	110	340	870	118				
	240	510	920	60	310	1330	800	238				
	360	2750	700	90	880	2710	800	405				
				120	1020	2860	600	352	110	48	25.3	99
N,N-Dimethyl	120	under cure		45	100	260	810	97				
	240	560	890	60	270	1340	850	237				
	360	2510	700	90	740	2200	600	417				
				120	970	2830	620	395	97	48	26.3	82
N,N-Diethyl	120	under cure		45	40	110	1000	40				
	240	120	1040	60	210	890	860	198				
	360	2600	700	90	870	2920	670	410				
				120	1190	3200	600	360	76	49	24.0	53
N,N-Dibutyl	120	under cure		45	50	50	1040	28				
	240	70	930	60	100	400	1020	120				
	360	2000	870	90	700	2570	720	442				
				120	980	2930	630	363	81	49	27.1	70
N-Ethyl N-phenyl	120	under cure		45	80	80	910	15				
	240	90	830	60	120	500	870	111				
	360	1240	930	90	500	1990	800	287				
				120	900	2800	680	395	120	47	31.5	121
N-cyclohexyl-2-benzothiazyl Sulfenamide (0.75 part)	120	under cure		45	150	510	950	135				
	240	430	1030	60	290	1120	870	202				
	360	2090	860	90	620	2100	670	342				
				120	850	2510	660	410	112	48	27.8	211
N-cyclohexyl-2-benzothiazyl Sulfenamide (1.2 part)	120	under cure		45	590	2250	750	347				
	240	2630	750	60	840	2520	660	410				
	360	2760	550	90	1200	2900	560	305				
				120	1350	2880	510	285	72	50	25.3	95

[a] Temperature Rise Above 212° F. [b] Kilocycles per 0.5 inch crack growth.

stocks, the conventional stress-strain data obtained with low temperature cures was employed.

Stress-Strain measurements were made by the A.S.T.M. procedure as given in the A.S.T.M. Standards on Rubber Products D412-41. The oven method of accelerated aging, D573-45, was followed using an operating temperature of 158 or 212° F., depending on the type of stock.

Durometer Hardness was measured according to A.S.T.M. designation D676-44T on tensile slab specimens piled three high. All readings were instantaneous.

Tear Resistance was determined on Die B specimens by the A.S.T.M. procedure D624-44.

T-50 test was carried out in accordance with A.S.T.M. designation D599-40T.

Rebound measurements were made on the Lupke Resiliometer on a molded cylindrical disk 1.129 inches in diameter and 0.5 inch in thickness.

Compression Set was determined by the A.S.T.M. procedure D395-40T, Method B, using a specimen molded to the required size.

Hysteresis was determined by A.S.T.M. designation D623-41T, Method A, on specimens molded to size.

Flex-Crack Growth was determined by A.S.T.M. designation D430-40, Method B, on specimens molded to the required dimensions.

Table I shows the effect on physical properties, in a pure gum natural rubber stock, of five different 2-benzothiazyl-N,N-disubstituted thiocarbamyl sulfides. From the stress-strain data the order of decreasing accelerator activity as a function of the secondary amino group is -N-cyclopentamethylene, -N,N-dimethyl, -N,N-diethyl, -N,N-dibutyl, and -N-ethyl-N-phenyl. This order is confirmed by the amount of combined sulfur as indicated by the T-50 values.

The stress-strain properties of these vulcanizates reach a peak at an early cure, and compare favorably in magnitude with the vulcanizate obtained with the same amount of tetraethylthiuram disulfide. The scorch characteristics are definitely superior to those of tetraethylthiuram disulfide, but definitely inferior to those of 1.0 part of 2,2′-dibenzothiazyl disulfide. However, in loaded stocks the subject type of accelerator has a pronounced delayed action characteristic as shown by the scorch data of the natural rubber vulcanizates of Figure 2; and here there is a marked improvement in scorch characteristics as compared with an equal or greater amount of 2-mercaptobenzothiazole.

The same order of decreasing accelerator activity pertains to the reinforced GR-S stocks (listed in Table II) as was cited in Table I as applied to natural rubber; however, the progressive difference in stress-strain properties is less marked. These accelerators are definitely faster curing than N-cyclohexyl-2-benzothiazyl sulfenamide and are comparable to the latter in respect to all physical properties studied, an actual slight advantage in compression set and hysteresis being shown.

Based on the hysteresis, compression set, and flex-life values of the vulcanizates containing 0.75 parts of the N-ethyl-N-phenyl derivative and 0.75 parts of N-cyclohexyl-2-benzothiazyl sulfenamide, a decided undercure is demonstrated. These results indicate that the N-ethyl-N-phenyl derivative is the weakest accelerator of the series studied, and that an increased amount of the N-cyclohexyl-2-benzothiazyl sulfenamide is required to produce vulcanizates of comparable physical properties.

After a close examination of the data in Tables I

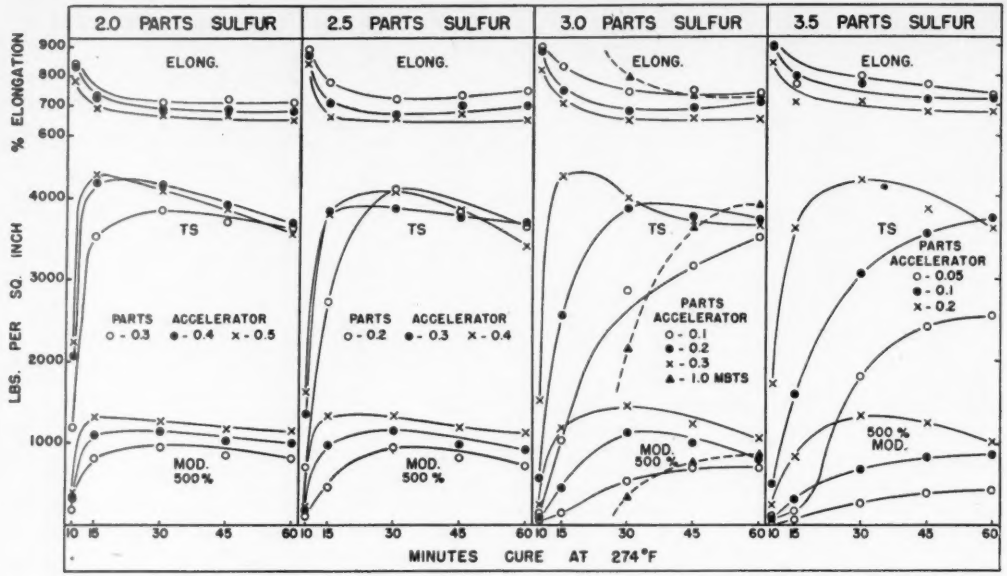

2.0 PARTS SULFUR
2.5 PARTS SULFUR
3.0 PARTS SULFUR
3.5 PARTS SULFUR
% ELONGATION
LBS. PER SQ. INCH
ELONG.
TS
PARTS ACCELERATOR
○ - 0.3 ● - 0.4 × - 0.5
○ - 0.2 ● - 0.3 × - 0.4
○ - 0.1 ● - 0.2 × - 0.3 ▲ - 1.0 MBTS
○ - 0.05 ● - 0.1 × - 0.2
MOD. 500%
500 % MOD.
MINUTES CURE AT 274°F

FIG. 1—Various 2-benzothiazyl-N,N-diethylthiocarbamyl sulfide-sulfur ratios in a pure gum natural rubber stock.

and II, as well as of other compounding data, it was decided to select the -N,N-diethyl derivative for further compounding studies. This decision was based on (a) the desirable melting point of the compound, namely 77-78° C., which would impart ready dispersibility, (b) the relatively superior delayed action characteristic in both natural rubber and GR-S, (c) the high degree of vulcanization obtained, and (d) the good stress-strain properties and low hysteresis and set values as compared with similar vulcanizates obtained with currently employed accelerators.

2-Benzothiazyl-N,N-diethylthiocarbamyl Sulfide-Sulfur Ratios

The same natural rubber pure gum base formula—pale crepe, 100; stearic acid, 1; zinc oxide, 10—was employed for a study of accelerator-sulfur ratios. The results are illustrated in Figure 1. Since the purpose of this phase of the investigation was to determine the effect of varying accelerator-sulfur ratios on the rate of cure, the accelerator content was adjusted on the basis of the sulfur content employed to achieve vulcanizates having comparable states of cure. Ideally, of course, formulations of constant accelerator content should be compared. This is obviously impractical, however, since enough accelerator to produce satisfactory cures for stocks with 2.0 or 2.5 parts sulfur would be far too great for stocks with 3.0 or 3.5 parts sulfur. All in all, considering the inherent limitations of the material, it seems probable that the twelve ratios employed represent a reasonable compromise.

From the physical properties of the stocks graphed in

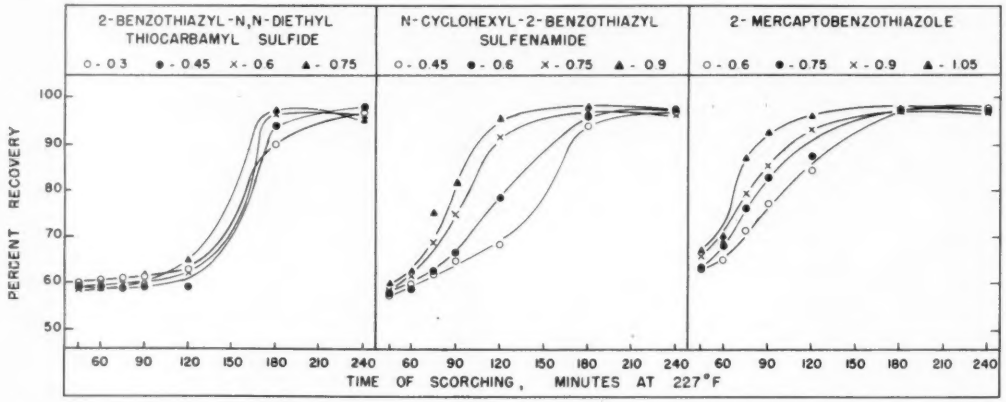

2-BENZOTHIAZYL-N,N-DIETHYL THIOCARBAMYL SULFIDE
○ - 0.3 ● - 0.45 × - 0.6 ▲ - 0.75
N-CYCLOHEXYL-2-BENZOTHIAZYL SULFENAMIDE
○ - 0.45 ● - 0.6 × - 0.75 ▲ - 0.9
2-MERCAPTOBENZOTHIAZOLE
○ - 0.6 ● - 0.75 × - 0.9 ▲ - 1.05
PERCENT RECOVERY
TIME OF SCORCHING, MINUTES AT 227°F

FIG. 2—Scorch characteristics of natural rubber tread stocks accelerated with 2-benzothiazyl-N,N-diethylthiocarbamyl sulfide, N-cyclohexyl-2-benzothiazyl sulfenamide, or 2-mercaptobenzothiazole.

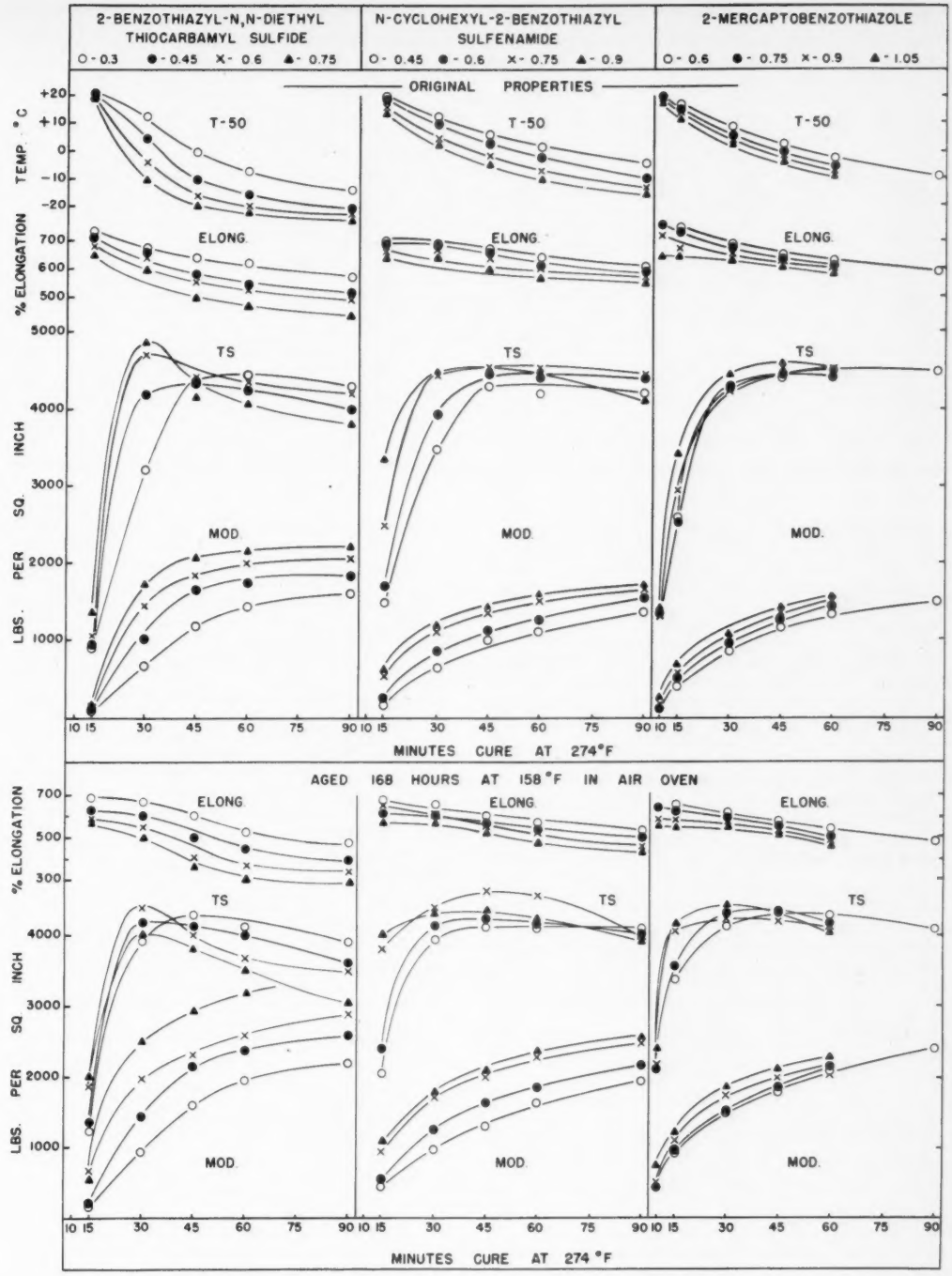

2-BENZOTHIAZYL-N,N-DIETHYL THIOCARBAMYL SULFIDE
○ - 0.3 ● - 0.45 × - 0.6 ▲ - 0.75
N-CYCLOHEXYL-2-BENZOTHIAZYL SULFENAMIDE
○ - 0.45 ● - 0.6 × - 0.75 ▲ - 0.9
2-MERCAPTOBENZOTHIAZOLE
○ - 0.6 ● - 0.75 × - 0.9 ▲ - 1.05
ORIGINAL PROPERTIES
T-50
ELONG.
TS
MOD.
TEMP °C
% ELONGATION
LBS. PER SQ. INCH
MINUTES CURE AT 274°F
AGED 168 HOURS AT 158 °F IN AIR OVEN
MINUTES CURE AT 274 °F

FIG. 3—Effect of accelerator concentration and time of cure on T-50, Modulus at 300% (Mod.), Tensile Strength (TS), and Elongation (Elong.) in a natural rubber tread stock.

TABLE III—EFFECT ON PHYSICAL PROPERTIES OF NATURAL RUBBER TREAD COMPOUNDS CURED WITH VARYING AMOUNTS OF ACCELERATORS.

Parts of Accelerator per 100 parts rubber	Cure at 274° F., Min.	Tear Resistance, lb./in. Original	Shore Hardness Original	Shore Hardness Aged [a]	Compression Set, % Original	Compression Set, % Aged [a]	Resilience (Lüpke), % Original	Resilience (Lüpke), % Aged [a]	Hysteresis, ΔT above 100° F. Original	Hysteresis, ΔT above 100° F. Aged [a]	Flex Life, Kilocycles per 0.5 in. Growth Original	Flex Life, Kilocycles per 0.5 in. Growth Aged [b]
2-Benzothiazyl-N,N-Diethylthiocarbamyl Sulfide												
0.3	60	990	66	68	33.3	18.0	52.0	52.5	48	50	590	430
0.45	60	905	70	77	30.1	14.8	53.5	54.0	53	52	421	45
0.6	45	935	74	77	27.4	12.1	53.5	55.5	52	54	123	32
0.75	45	818	74	78	23.2	11.7	53.5	55.0	51	55	46	17
N-Cyclohexyl-2-Benzothiazyl Sulfenamide												
0.45	60	930	65	70	34.3	19.9	52.0	52.5	48	56	770	985
0.6	60	1040	67	72	31.9	19.6	52.5	53.0	52	50	774	675
0.75	45	1070	69	73	30.5	18.5	52.5	53.5	54	54	757	585
0.9	45	1000	69	70	32.4	17.9	52.0	54.0	55	50	685	465
2-Mercaptobenzothiazole												
0.6	60	998	68	73	27.3	15.3	52.5	54.5	51	51	551	575
0.75	60	785	67	72	23.3	15.1	53.5	55.5	47	48	737	490
0.9	60	1015	68	72	23.5	14.8	53.5	54.5	51	48	541	526
1.05	45	1063	66	73	25.1	15.1	53.0	55.0	47	48	675	465

[a]Aged 168 hours at 158° F. in air oven. [b]Aged 96 hours at 158° F. in air oven.

Figure 1, and from results obtained in previous studies, the inference is drawn that 0.2 to 0.5 parts accelerator with from 3.0 to 2.0 parts of sulfur should be employed in pure gum natural rubber stock. It will be shown later that increased acceleration is required for reinforced or loaded natural rubber stocks. A stock cured with 1.0 part of 2,2'-dibenzothiazyl disulfide (MBTS) and 3.0 parts sulfur has been included for comparison. This particular stock compares most favorably in rate of cure and stress-strain characteristics with a stock containing 0.1 part of 2-benzothiazyl-N,N-diethylthiocarbamyl sulfide and 3.5 parts sulfur. The graphed results clearly illustrate the fast curing rate and high modulus attained with the latter accelerator at 274° F. These results were confirmed by corresponding data obtained at the higher curing temperature of 307° F.

Natural Rubber Tread Stock

For comparison of 2-benzothiazyl-N,N-diethylthiocarbamyl sulfide, N-cyclohexyl-2-benzothiazyl sulfenamide, and 2-mercaptobenzothiazole in various amounts in a typical natural rubber tread stock, the following formulation was chosen:

Smoked Sheet	100
Stearic Acid	3
Pine Tar	3
Zinc Oxide	5
MPC Black	50
Antioxidant	2
Sulfur	3
Accelerator	varies

The excellent scorch characteristics of the accelerator under study are clearly illustrated in Figure 2. It is interesting to note that this desirable property is retained almost irrespective of the amount employed over the range studied. On the other hand, as the amount of N-cyclohexyl-2-benzothiazyl sulfenamide is increased, the stock becomes considerably more scorchy, and in the higher amounts approaches the scorch characteristics of similar stocks cured with 2-mercaptobenzothiazole.

The good scorch characteristics of 2-benzothiazyl-N,N-diethylthiocarbamyl sulfide is reflected in the marked delayed action of the same stocks graphed in Figure 3, as indicated by the rapid increase in stress-strain properties in going from a 15 to a 30 minute cure at 274° F. These results are in agreement with the extremely rapid sulfur combination implicit in the T-50 values. The high modulus and maximum tensile strength reached at an early cure is also clearly shown. These same properties are illustrated for the comparative accelerators where a more gradual change is apparent with increase in cure time.

On aging, the vulcanizates cured with 2-benzothiazyl-N,N-diethylthiocarbamyl sulfide in the lower amounts compare favorably with those cured with the other two accelerators; however, in the higher amounts, a greater decrease in tensile strength and elongation is observed.

Some of the other common physical properties which are pertinent to a tread stock are given in Table III. More tightly cured stocks are obtained with the accelerator under study as is evidenced by a slightly higher hardness and resilience and a lower set, hysteresis, flex and tear resistance.

From these physical properties it may be concluded that the vulcanizates containing 2-benzothiazyl-N,N-diethylthiocarbamyl sulfide in higher amounts are definitely over vulcanized. In this type of formulation this accelerator, when used at a 3.0 part sulfur level, must be employed in the lower amounts in order to obtain satisfactory physical properties.

An improvement in stress-strain properties and flex-life of the vulcanizate after aging is obtained by decreasing the sulfur content and increasing the accelerator content in the same basic formulation. Such an investigation was conducted for three different sulfur-accelerator ratios; the results are recorded in Table IV. Values for corresponding physical properties in each of the three vulcanizates studied are similar, and are acceptable for tread formulations employed in normal practice.

From the physical properties graphed in Figure 3, as well as those tabulated in Tables III and IV, it is quite evident that 2-benzothiazyl-N,N-diethylthiocarbamyl sulfide is a very powerful and effective accelerator which requires rather precise adjustment to achieve the desired results. It appears that an accelerator range of 0.3 to 0.7 parts with 3.0 to 1.5 parts of sulfur should afford effective vulcanization.

TABLE IV—EFFECT ON PHYSICAL PROPERTIES OF NATURAL RUBBER TREAD COMPOUNDS CURED WITH DIFFERENT SULFUR-2-BENZOTHIAZYL-N,N-DIETHYLTHIOCARBAMYL SULFIDE ACCELERATOR RATIOS.

Per 100 Parts Rubber		Cure at	Modulus at 300%, lb./sq. in.		Tensile Strength, lb./sq. in.		Elongation, %		Tear Resistance lb./in.	T-50, °C.
Parts Sulfur	Parts Accelerator	274° F., Min.	Original	Aged [a]	Original	Aged [a]	Original	Aged [a]	Original	Original
2.5	0.4	30	810	1500	3790	4410	660	630	370	+15.8
		45	1330	2200	4730	4300	650	520	883	+ 1.6
		60	1480	2400	4470	4300	600	490	958	— 5.8
		90	1590	2320	4680	4130	600	480	830	—11.4
2.0	0.5	30	730	1400	3450	4490	670	650	195	+16.6
		45	1320	2190	4680	4300	640	520	980	+ 3.6
		60	1510	2320	4600	3990	610	500	893	— 2.8
		90	1590	2400	4690	4380	590	480	863	— 8.0
1.5	0.7	30	480	1190	2680	3920	660	630	103	+17.8
		45	1230	1980	4730	4580	660	580	935	+ 6.6
		60	1490	2250	4690	4390	610	510	980	+ 0.8
		90	1600	2390	4690	4290	590	490	1020	— 3.8

Per 100 Parts Rubber		Cure at	Shore Hardness		Compression Set, %		Resilience (Lüpke), %		Hysteresis, ΔT above 100° F.		Flex-Life, Kilocycles per 0.5 in. Growth	
Parts Sulfur	Parts Accelerator	274° F., Min.	Original	Aged [a]	Original	Aged [a]	Original	Aged [a]	Original	Aged [a]	Original	Aged [b]
2.5	0.4	45	60	70	57.6	17.4	53.5	58.5	42	36	563	500
		60	65	72	39.5	15.0	55.0	57.5	37	40	491	258
2.0	0.5	45	60	70	56.8	15.8	53.0	57.5	46	36	620	597
		60	63	72	37.5	14.6	55.0	57.5	40	38	894	624
1.5	0.7	45	57	70	55.8	14.2	53.0	57.0	48	41	530	497
		60	62	70	34.6	13.2	54.0	57.5	40	40	696	556

[a]Aged 168 hours at 158°F. in Air Oven. [b]Aged 96 hours at 158°F. in Air Oven.

Results with GR-A Polymers

The results of a preliminary investigation indicated that 2-benzothiazyl-N,N-diethylthiocarbamyl sulfide is an effective accelerator for GR-A polymers. Typical properties imparted by this accelerator as compared to 2,2'-dibenzothiazyl disulfide are illustrated by the following stocks:

GR-A	100.0	100.0
Stearic Acid	1.0	1.0
Zinc Oxide	5.0	5.0
SRF Black	60.0	60.0
Dibutyl Phthalate	30.0	30.0
Sulfur	1.5	1.5
2-Benzothiazyl-N,N-diethylthiocarbamyl sulfide	0.5	....
2,2'-Dibenzothiazyl disulfide	....	1.5

The values of tensile strength, modulus at 300%, elongation, hardness, compression set, and resilience of the vulcanizates obtained with these two accelerators are listed in Table V. The 2-benzothiazyl-N,N-diethylthiocarbamyl sulfide imparted slightly higher modulus and resilience, somewhat lower tensile strength and elongation, and a marked improvement in compression set as compared with the 2,2'-dibenzothiazyl disulfide.

Vulcanizates have also been prepared with 2-benzothiazyl-N,N-diethylthiocarbamyl sulfide in GR-I. However, these studies have not progressed sufficiently to justify reporting at this time.

Conclusions

Evaluation data indicate that a single molecular structure such as the 2-benzothiazyl-N,N-disubstituted thiocarbamyl sulfides represents a series of powerful vul-

TABLE V—COMPARATIVE EFFECTS OF 2-BENZOTHIAZYL-N,N-DIETHYLTHIOCARBAMYL SULFIDE AND 2,2'-DIBENZOTHIAZYL DISULFIDE ON PHYSICAL PROPERTIES IN GR-A.

Cure at 310° F., Min.	Modulus at 300%, lb./sq. in.		Tensile Strength, lb./sq. in.		Elongation, %		Shore Hardness		Compression Set, %	Resilience (Lüpke), %
	Original	Aged [a]	Original	Aged [a]	Original	Aged [a]	Original	Aged [a]	Original	Original
				2-Benzothiazyl-N,N-Diethylthiocarbamyl Sulfide						
20	1200	2170	1990	2240	500	310	54	65		
30	1340	2170	1900	2260	440	310	55	65	14.4	47.5
45	1400	2150	1960	2420	430	340	56	64	11.7	48.0
				2,2'-Dibenzothiazyl Disulfide						
20	1010	2100	2080	2210	580	320	54	65		
30	1240	2100	2050	2270	520	330	54	64	17.1	46.5
45	1340	2110	1950	2400	470	360	56	64	13.2	47.0

[a]Aged 72 hours at 212°F. in Air Oven.

canization accelerators for both natural and synthetic rubbers. Many of the desirable characteristics of 2-mercaptobenzothiazole such as good stress-strain properties and tear resistance coupled with the effectiveness of small amounts of the thiurams to produce rapid sulfur combination have been incorporated in this one type of molecule which also exhibits a desirable delayed action. Variation in the secondary amino group and sulfur-accelerator ratios of the -N,N-diethyl derivative have been quite thoroughly investigated. Although most of the formulations studied were of the type used in conventional tire manufacture, the possible applications of the study to other types of stocks should be easily translatable.

ACKNOWLEDGMENT

The authors are indebted to several of their colleagues, particularly E. J. Ritter and H. M. Ray who assisted with the experimental work. The review and criticism of this paper by H. I. Cramer and J. L. Eaton is greatly appreciated.

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Additional Reports of Avoidable Accidents

BELOW are recorded several additional instances of avoidable accidents as recently reported in the *Rubber Safety Newsletter* issued by the Rubber Section of the National Safety Council:

Power Transmission Equipment: An employee at a tire plant lost his left index finger when his hand went into the unguarded bite where a chain traveled around a sprocket. This particular chain and sprocket was guarded on one side and around the perimeter, but was open on the side toward the operator. Previous similar accidents at this and other plants have illustrated the need for completely enclosing such hazardous power transmission equipment wherever employees are exposed.

Mills: An employee lost four fingers of his left hand when it became caught in the bite of a warming mill. He was attempting to feed cold stock through the mill and was apparently working too near the bite. Stock flipped over from the back of the mill and pinned his left hand under it, drawing it into the bite. The unapproved cotton gloves he was wearing undoubtedly contributed to his hand being held by the stock.

The following three items included in the remedial action plan developed after this accident tell a rather pointed story: (1) Mill room safety training will be revived; (2) An approved type of mill glove will be made available for use where (gloves are) absolutely necessary . . . cotton, knit wrist, and flared gauntlet gloves are to be outlawed immediately; (3) Outstanding and cancelled work orders for improving the sate operation of mills will be reviewed and pushed along as rapidly as possible.

Static Spark Ignites Gas: An operator was filling a squirt can with a mixture of alcohol and gasoline from a gallon safety can (without a flame arrester). At the same time, another employee pulled a large piece of ply from the same table and created a static spark which ignited the fumes being dissipated from the pouring operation.

The operator dropped the full gallon safety can, more gasoline was spilled, and it also began burning. One operator put out the fire on the table and attempted to put out the fire on the floor by covering it with a liner. This proved unsuccessful, and a third employee put it out with a CO_2 extinguisher.

As corrective measures, the following action was taken: (1) An order was placed to ground production salvage tables where there is a possiblilty of static electricity igniting flammable solvents; (2) Employees are being re-instructed on the hazards of handling flammable solvents; (3) The safety cans described above are being replaced by others which are equipped with flame arresters.

Welding and Burning Hazards: One of the most severe fires in company history recently occurred at a footwear plant because of improperly protected burning operations. The fire started when sparks from an acetylene burning operation being conducted outside a building at the fourth floor level dropped down and entered an open window at the second floor level, which leads directly into a wool dust collecting room. Fire flashed from the dust collecting room and spread to combustible storage in the building.

A complete report of this fire will be issued shortly. In the meantime all plants are urged to immediately review their welding and burning permit procedures to make certain that adequate precautions are being taken to prevent fires from these operations.

OTTO DE VRIES

HIS LIFE AND WORK IN THE RUBBER INDUSTRY

By A. VAN ROSSEM

Director, Rubber Research Institute, T.N.O., Delft, Holland

ON November 27, 1948, Dr. Otto de Vries, a leading contributor to the science of rubber, passed away. Since Dr. de Vries was not actively engaged in rubber technology from 1930 to the time of his death, it is quite understandable that his demise was not immediately acknowledged in present-day rubber circles. However, the influence of his work during the period 1915 to 1930 has been so great, it behooves us to re-evaluate his life and the work he carried out in the cultivation of rubber in the Netherlands East Indies (Indonesia).

Otto de Vries was born in 1881 at Amsterdam, the son of the famous botanist, Dr. Hugo de Vries. He attended the usual schools in Amsterdam and studied chemistry at the Universities of Leyden and Zurich in Switzerland. He took his doctor's degree at Zurich on a thesis entitled: "On Complex Iridicun Compounds."

Although his scientific career in the Netherlands was secure, Dr. de Vries sought out a post in the Netherlands East Indies. In 1909 he became associated with the Experimental Station for Tobacco at Klaten, Java, as a chemist. He continued this work until 1915, during which time he published 26 papers on the cultivation of tobacco. Some of these papers are recognized, even today, as standards on the subject.

The Late Otto de Vries

Work in Rubber Cultivation

In 1915, Dr. de Vries became director of the Central Rubber Station at Buitenzorg, Java. Interest in rubber at this time was increasing as a result of a general rubber exhibition which the Netherlands Government Rubber Institute of Delft had organized in Buitenzorg. The Institute's demonstrations of modern methods of testing and vulcanization had aroused considerable interest throughout the world. The aim of the newly-formed rubber station was to carry out a systematic investigation into the preparation of plantation rubber and to raise the quality of plantation rubber grown in Java.

During the 15 years (1915-30) that Dr. de Vries was in charge of this station, a constant stream of scientific papers appeared. Most of these were published in *Archief voor de Rubbercultuur in Nederlands-Indie*. English translations and summaries were often furnished. In addition, many other papers appeared in other rubber periodicals.

Dr. de Vries' research on rubber may be divided into four groups covering the following subjects:

(1) Factors responsible for the variability of plantation rubber.
(2) Latex and the coagulation process.
(3) Viscosity and plasticity of plantation rubber.
(4) Botanical investigations on selection.

Variability of Plantation Rubber

When Dr. de Vries began his work at the rubber station, he was aware of the great variability in the properties of plantation rubber before and after vulcanization. He realized that a reduction in this variability would be of great value to the plantation rubber industry. Variability is caused by a great many biological factors and conditions arising during preparation of the latex.

In an attempt to control the biological factors, Dr. de Vries and his associates directed their studies to problems of the soil, climate, effects of altitude, wintering and aging of trees, tree diseases, the influence of green manuring, and the various tapping methods. In this latter category, attention was paid to tapping intervals, deep and shallow tapping, length and number of cuts, the height of the tapping cut, changing the tapping surface and topping (polarding) the trees.

As to the chemical reactions which bear upon the uniformity of plantation rubber, Dr. de Vries considered the influence of coagulants upon latex. During the years 1917-18, he studied the effects of sugar, and later, the effects of sulfuric acid, sulferous acid, and especially acetic and formic acid on latex. He also studied the influences upon concentration of the latex, determination of this concentration, pre-coagulation, the influence of serum substances, washing time, maturation of the coagulum, drying and smoking temperatures, and many other factors.

Attention was also paid to a number of special methods of preparation of plantation rubber such as slab rubber, the Brazilian method, Kerbosch rubber, etc. Dr. de Vries pointed out on many occasions that the influence of the chemical factors could be lessened by standardization of the methods of preparation of crepe and sheet.

As regards the biological factors, however, they could only be overcome partially by standardizing tapping methods.

In 1920 Dr. de Vries published a book, "Estate Rubber, Its Preparation, Properties and Testing," in which he reviewed all the literature on the subject and described the results of his own investigations. The book is still of value to those wishing to study the variability of plantation rubber. It may be noted that Dr. de Vries was the first to urge that plantation rubber should be prepared at central factories, a problem which is with us even today.

Latex and the Coagulation Process

At the very onset of his career with the rubber station, Dr. de Vries directed many of his studies to the properties of rubber latex. Particularly, he investigated methods for the determination of the rubber content of Hevea latex. He was especially opposed to the use of the Metrolac and similar instruments. In 1921 preserved latex was transported to the United States and Europe for the first time. Rubber in this form was used in the manufacture of paper (as outlined in the Kaye process) and in the manufacture of a variety of rubber articles. Dr. de Vries, recognizing the advantages of this method, made a detailed study of the influence of ammonia on the properties of latex. He also studied creaming and preservation with sodium hydroxide.

Dr. de Vries studied the theory of the coagulation process very carefully. In 1924 he published a general theory of the coagulation process. Subsequently, he wrote nine articles on experimental results to prove his general theory. This theory may be summarized as follows: The coagulation of latex consists of two parts, first, addition of acid (H') which causes a decharge of the rubber particles, and secondly, a process of coalescence. This coalescence is caused by an enzyme, which Dr. de Vries called coalase, and which he proved to be present in fresh latex. Since Dr. de Vries left the Far East our knowledge of the coagulation process has remained almost stationary, few articles having appeared since that time.

Viscosity and Plasticity

When Dr. de Vries began his work, viscosity determinations of plantation rubber were in general use. A few years later, he developed a special method of determining the viscosity of a rubber solution which had been acidified with hydrochloric acid. The significance of this method was not generally recognized and never gained popular use.

Immediately after the appearance of an article by Williams on the plasticity of rubber mixings in 1924, Dr. de Vries adopted this method for studying the plasticity of plantation rubber. In the course of the next few years, he published seven papers on this subject. In 1928, he issued a summarizing paper on coagulation, structure and plasticity, in which he attempted to analyze the various factors influencing the plasticity of plantation rubber.

Botanical Investigations on Selection

In 1925 a reorganization of the experimental stations on Java took place. The Central Rubber Station at Buitenzorg was reorganized under the new name "Proefstation voor de rubber" (Experimental Station for Rubber). Under this reorganization, Dr. de Vries had to give some time to the problems of selection. In a short time he mastered this subject and published a series of articles on selection which appeared in *De Bergcultures* and other publications. These articles covered such subjects as superior planting materials (seedlings and budgrafting), production figures on superior planting materials, the significance of the Ashplant method for determining the production of Hevea trees, etc.

General Significance

From the foregoing it is obvious that Dr. de Vries carried out an enormous amount of scientific work in plantation rubber and its preparation. His influence upon the plantation rubber industry has been great. As director of the Central Rubber Station and later of the Experimental Station for Rubber at Buitenzorg, he not only carried out scientific work, but was in daily, advisory contact with the plantation industry. In this capacity, his influence was even more widely felt. Details of his work may be found in the Annual Reports of these organizations for the years 1916 to 1929. In these reports a gradual improvement in the quality of plantation rubber may be noted, mainly as a result of his work.

Dr. de Vries understood that if the rubber industry in the Far East were to prosper, it was necessary to have proper insight into the needs of the rubber industry in the United States and Europe. During his periods of leave, he visited rubber installations in the United States and in Europe and discussed crude rubber problems with prominent industry figures. In 1922, as a result of his visits abroad, Dr. de Vries published the book "Rubber on the Market and in the Factories." A reading of this book indicates that not only was he an eminent scientist, but he was a student of the world rubber market.

Dr. P. Schidrowitz in his "Views and Reviews" wrote after publication of this book: "We have long known Dr. de Vries as an eminent rubber chemist and administrator of an important experimental station but in the report under review, he reveals himself to be, in addition, an acute man of affairs and as possessing a remarkably wide, sane and exact grasp of the practical problems which confront those preparing and marketing plantation rubber on one hand, and dealing with it in the factory on the other hand."

In his lifetime, Dr. de Vries was a champion for the production of "certificate rubber," by which was meant a rubber which complied to certain specifications in respect to plasticity, speed of cure, and mechanical properties after standard cure. Producers, however, dropped the preparation of this "graded" rubber because manufacturers, at that time, did not care to pay the extra premium it involved. Today, "graded" rubber seems to be one of the necessities for a prospering future for the natural rubber industry. Producers in the Far East would have been wiser in the period around 1930 to have taken Dr. de Vries' advice.

Dr. de Vries' work at Buitenzorg was important not only to rubber producers on Java, but has been of great value to the cultivation of rubber throughout the Netherlands Indies, Malaya and Indo-China. His work has also had great influence on the rubber industries of the United States and Europe. His services to the rubber industry were properly recognized when he was made Colwyn Medalist for the year 1934. In 1929, Dr. de Vries was president of the Fourth Pacific Science Congress at Buitenzorg. In the same year he was appointed Professor of Chemistry at the Medical University at Batavia.

When Dr. de Vries left the Far East in 1930, his numerous contributions to rubber cultivation were fully recognized. The bibliography of his work on rubber

contains 137 articles, 2 books, 14 annual reports and a large number of short communications and popular articles. The full significance of his work, however, was even greater, for it proved of special benefit to the Netherlands East Indies, where he spent so many years.

Dr. de Vries was 50 years old when he returned to the Netherlands, and not disposed to early retirement. On October 24, 1930, he was appointed General-Director of the Agricultural Stations in Groningen. His principal task was to co-ordinate the work of all the Agricultural Stations which until that time had carried out their research almost independently of each other. It was realized that the problems of modern agriculture were so complex, they could only be solved by the cooperation of agriculturists, chemists, physicists and biologists working together under a central administration. Dr. de Vries was chosen for this job.

It is beyond the scope of this article to go into detail about the results of his work in this direction. Suffice it to say, that when Dr. de Vries left Groningen in 1943, coordination of research had been achieved. In those 13 years he had occasion to publish a long list of articles on investigations on various subjects of agricultural science.

In 1943 Dr. de Vries became president of the then newly-organized National Council for Agricultural Research of the Central National Council of Applied Research in the Netherlands. He acted as head of this Division until a few months before his death. Although his activities during this time were not allied with rubber, he maintained his interests in that direction. The writer remembers his presence at the First Rubber Technology Conference in London in 1938, where he met many of his former colleagues and friends.

The war years in the Netherlands were very hard on Dr. de Vries. Among other hardships he bore was the knowledge that one of his sons, who had studied at Delft University, was killed by the Germans. Another son, a married daughter and his wife survive.

The Netherlands and Indonesia are indebted to Dr. Otto de Vries for his invaluable work in various fields, particularly in the field of rubber technology. That feeling is probably shared by rubber technologists throughout the world.

Thermoplastics in Resilient Concrete

RESILIENT concrete is now an established material which is finding its chief use as a flooring medium. An interesting article on this subject by N. W. Farmer appeared in a recent issue of *Plastics (London)*, from which the following data is reproduced:

The composition of resilient concrete floors is a concrete containing a thermoplastic resin, which is added to the concrete mix in the form of a dilute aqueous dispersion of polyvinyl acetate. This addition increases the flexibility of the concrete and also its adhesion to the base floor. Floors of a thickness of 3/16 to 1/4 in. have been successfully laid on an ordinary concrete base, and the resiliency obtained is equal to that of wood.

Since these floors possess a high degree of elasticity, they show no tendency to develop cracks, as is the case when more rigid flooring materials are used. Large areas can be laid continuously, and expansion joints are not required. Various decorative effects can be obtained by the use of white or ordinary Portland cement, colored fillers and different aggregates.

To explain this unique property of polyvinyl acetate emulsions, a short diversion is necessary. If a plasticized emulsion of polyvinyl acetate is spread in a thin layer on a glass plate and allowed to dry, a tough, elastic, continuous film is produced. If the experiment is repeated with the addition of cement and fillers, a continuous film of the resin is produced, with the aggregate, coated with hydrated cement, dispersed throughout the film. In other words, the concrete is dispersed in the resin. If, however, a mix be made using a much larger amount of cement and filler, a concrete is produced with the hydrated cement as the continuous phase, and dispersed throughout are particles of the elastic resin.

In practice, both systems, viz., resin in cement, and cement in resin, exist side by side. The relative amount of each depends on the amount of polyvinyl acetate emulsion used in the mix. Too much polymer yields a product which will be so soft as to yield impressions of heavy furniture, whereas too little polymer gives a material approaching that of ordinary concrete in hardness and elasticity.

It is easy to produce small experimental tiles of resilient concrete and ordinary concrete. If these tiles are mounted on a rigid base and then struck with a hammer, the concrete tile will fracture in several directions, whereas the tile made from resilient material will show only a slight impression of the hammer head. Due to the resiliency, the effect of the blow is spread over an appreciable area instead of being confined to the point of impact.

For success in laying resilient concrete, the following facts are useful: Portland, Snowcrete or Cement Fondu cements may be used. The aggregate can be selected from a wide range, including granite from ⅛ in. to dust, Derbyshire spar, sharp sand, cork granules and vermiculite. The proportion of cement to aggregate may vary from one-half to one-third by volume, depending on the fineness of the aggregate. Colored pigments may be added also. If a warm floor is required, cork granules should replace part of the aggregate.

Polyvinyl acetate emulsions suitably compounded for this work are manufactured by many firms, including Vinyl Products, Ltd., of Carshalton, Surrey, England. These emulsions contain 55 per cent of solids and for use should be diluted with water. For general work, one part of emulsion to two parts of water is used; if extra resiliency is required, the dilution need not be carried so far.

The cement, color and aggregate are mixed dry. The diluted emulsion is then added and mixed in until a soft putty consistency is obtained. The amount of emulsion required is about 20 per cent. of the volume of the dry ingredients. Some floor layers prefer a stiff mix, others a softer mix; the proportion of resin may, therefore, vary.

The mix is applied on a suitable base to a thickness of 3/16 to 1/4 in. The surface obtained should be smooth and compact and should not require further trowelling. Some workers, however, consider a final trowelling is necessary, and the time occupied varies with the method used.

The floor before coating should be level; if not, this should be rectified with a cement-sand concrete. Whether the base be porous or not, it should be thoroughly soaked with water before the floor is laid.

Editorials. . .

Rubber Position

AS RUBBER purchasing agents well know, and as production heads and cost estimators in the plants have been advised, the price of natural rubber has risen to its highest level in many years. It has already reached and surpassed the 26-cent mark for No. IX prime, and off-grades are not too far behind. There are several reasons for the current trend, the following being the major factors: (1) Shortage of supply for nearby shipments; (2) Increased consumption in the United States and comparatively well-maintained consumption in all other countries; (3) Russian purchases; and (4) Stockpiling, mainly by the United States and England.

The first of the factors listed—shortage of supply for nearby shipments—is undoubtedly the number one reason for the rising price trend. This shortage may be laid at Indonesia's door, where supplies have been backing up due to currency uncertainty. It is estimated in Singapore circles that backed-up stocks in Indonesia already total between 60,000 and 80,000 long tons. As a result of the growing shortage, which may be alleviated at any moment, speculation has been rife in the Singapore market which, in turn, has resulted in higher prices in the American market.

According to reports from Amsterdam, the economic recovery of Indonesia is handicapped by political developments. The crux of the situation seems to be the firm intent of the Indonesian government to secure joint Indonesian-Dutch operations of leading Dutch enterprises, with an eventual 51 percent of Indonesian participation. With regard to smallholders, the target of the Indonesian Government seems to be a material increase in the cooperative system, thus eliminating Chinese traders and guaranteeing a fair price to the smallholder for his product. With this philosophy spreading throughout the territory, estate operation of all kinds has been considerably handicapped by a series of strikes. The monetary situation, while still uncertain, is expected to iron out satisfactorily in the long run.

The second factor—increased consumption—is also of considerable importance in the worldwide picture. Consumption of natural rubber in the United States in the first quarter of the current year amounted to approximately 178,000 long tons, as compared with less than 150,000 in the first quarter of 1949. With the record-breaking total of 44,670,588 vehicles registered last year, of which 36,292,703 were private automobiles, the tire industry anticipates the best replacement tire business in its history. Adding to this situation is the fact that the production of automobiles, despite the just-settled Chrysler strike, is running in excess of 6,000,000 on an annual basis, assuring a market of well over 24,000,000 original equipment tires.

The third and fourth factors—Russian purchases and stockpiling—are both supplementary in nature, but in a declining supply market are of vital importance. Russia's purchases have been running in lots of from 15,000 to 30,000 long tons, amounts which have an immediate effect on the statistical position. No official data on the stockpiling of rubber, here or abroad, is available, but the tightening of international tension and the progress of the "cold war" has led to stepped up stockpiling efforts. It is estimated in some quarters that approximately 500,000 long tons of rubber have gone into governmental stockpiles since the middle of 1947, with the United States accounting by far for the greater portion of this amount.

It would be assumed that higher prices on natural rubber would lead to increasing use of synthetic rubber. This is actually the case, but a time lag is involved between plans and performance. GR-S inventories have declined from about 99,000 long tons in January, 1949, to approximately 60,000 tons at present. With this shrinkage in inventory and larger orders from the industry, the Office of Rubber Reserve has been stepping up monthly production since the first of the year. Production jumped from 18,000 tons in January to some 25,000 tons in April, and monthly production of 30,000 tons is anticipated by June. Industry would like about 35,000 tons in the current month, but it is doubtful whether ORR can produce more than 28,000 tons.

Although the present high price of natural rubber is vexing the domestic rubber manufacturing industry, we doubt whether it will prove of long duration. It isn't in the cards for the price to remain above 23 cents for too long a period. We are entering the summer months, with the usual decline in consumption, plus the fact that greater quantities of synthetic rubber will be available by July or August. The thought, however, that speculation in far-off Singapore can still upset the domestic market in natural rubber remains a disturbing one.

CURRENT NEWS OF THE MONTH

PRESENTATION OF 24 TECHNICAL PAPERS FEATURES MEETING OF RUBBER DIVISION

THE Division of Rubber Chemistry of the American Chemical Society held a very satisfactory Spring Meeting at the Book-Cadillac Hotel in Detroit, Mich., on April 19, 20 and 21. It was the 56th meeting of the Division and was held in conjunction with the 117th national meeting of the parent society. The national meeting was divided into three sessions, the first held at Houston, the second at Philadelphia and the third at Detroit. Approximately 2,760 members and visitors registered for the Detroit session, with attendance at the meeting of the Rubber Division estimated at 650. As usual, the Division meeting featured the presentation of technical papers, a business session, the divisional banquet, and a luncheon meeting of the 25-Year Club.

The technical papers were presented at four separate sessions and were again grouped by specific subjects insofar as possible. This method of grouping papers has proved very successful and has won the complete approval of the membership. Twenty-four papers were presented, many of which were followed by considerable floor discussion. The paper on "The Evaluation of Butadiene-Styrene Elastomers for Low Temperature Service," which was scheduled to be given by Messrs. Mitton, Boyle, Griffis and Brown, of the Engineer Research and Development Laboratories at Fort Belvoir, Va., was withdrawn because official approval could not be secured in time.

Considerable interest was evidenced in the group of three papers treating with tetramethylthiuram disulfide vulcanization prepared by members of the B. F. Goodrich Research Center. The first of these was concerned with the essential features of TMTD vulcanization, the second with radioactivity studies bearing on the vulcanization mechanism, and the third with the nature of zinc activation. By means of several different approaches, it was postulated that the TMTD molecule is a hybrid of two contributing forms, possessing a planar six-membered ring in which all four sulfur atoms are chemical equivalent.

Another paper which aroused much comment was that reviewing recent advances in latex masterbatching with channel and HAF blacks. Prepared by members of the Naugatuck Chemical Division of U. S. Rubber Co., this study was confined to so-called cold rubber latex and indicated that masterbatching latex with carbon black slurry improves tread wear an average of 7% over dry mixing. The paper also covered developments in the co-precipitation of latex and carbon black slurry. (EDITOR'S NOTE: Abstracts of all of the papers presented at the Detroit meeting were published in our March, 1950, issue).

Prior to the first technical session on April 19, a luncheon meeting of the 25-Year Club was held, under the chairmanship of Ed Kvet (Baldwin Rubber). Approximately 135 members attended the luncheon during which it was announced that Dr. R. P. Dinsmore, vice-president in charge of research of the Goodyear Tire & Rubber Co., will act as chairman of the club meeting to be held at the Cleveland meeting of the Division next October.

Active Business Session

The business meeting was held toward the end of the technical session on the morning of the second day, April 20. With Division Chairman F. W. Staveley (Firestone) presiding, it was one of the most active business meetings held in a number of years. Tribute was first paid, by a minute's silence, to two members whose deaths had occurred since the previous meeting, namely, R. D. Miller, of Detroit and G. W. Snee, of St. Louis.

L. V. Cooper (Firestone), chairman of the Membership Committee, reported that the division had a total of 2,044 paid members as of April 12, 1950, comprised of 1,774 regular and 270 associate members. It was announced that the Bibliography Committee, headed by Dr. J. McGavack (U. S. Rubber), was making progress on the edition covering the years of 1944 and 1945, and that that edition would be ready for distribution before the end of the year. Chairman Staveley also announced that as a result of a decision by the Executive Committee membership cards would be issued to Division members in the future. At present, no insignia or other recognition is available signifying division membership.

Treasurer C. W. Christensen (Monsanto) reported that division funds are approximately at the same level they have been for the past three years. However, it was announced that because the Division anticipates a heavier drain on its funds in the near future a special committee will be appointed to prepare a brochure showing the need for additional funds and charged with the responsibility of raising additional revenue. Harry Outcault (St. Joseph Lead) was named chairman of the committee.

The need for additional funds is evident in several directions. For example, the report of the Library Committee, of which Ben Garvey (Sharples Chemicals) is chairman, indicated that operation of the Union List of Books now falls heavily on the shoulders of private librarians in the Akron area. To relieve the pressure of such operation, the Division must supply approximately $100 a month, and it is hoped that subscriptions can be secured from various companies to assure this monthly amount for the next year or so. There were about 800 exchanges on the Union List last year.

New By-Laws Are Approved

Copies of the by-laws of the division, as amended by a special committee appointed for the purpose about three years ago, and tentatively approved by the Board of Directors, were furnished to all members of the division prior to the meeting. The new by-laws were unanimously adopted during the Detroit business meeting by an official vote of 164. Tellers at the meeting on the vote on the by-laws were H. L. Trumbull (Goodrich) and Ben Garvey (Sharpless Chemicals). Seward Byam (DuPont) was chairman of the committee charged with revising the by-laws. Dr. Staveley expressed the Division's thanks to this committee, with a note of special commendation to Mr. Byam for his tireless effort.

One of the major differences between the newly-approved by-laws and the previous ones is in the method of election of directors from the sponsored local rubber groups. The term is now two years, instead of one as heretofore.

The report on nominations of officers and directors for 1951, with elections scheduled for the next meeting, was given by W. W. Vogt (Goodyear). Nominated for officers were the following: *Vice-Chairman,* Waldo Semon (Goodrich) and W. J. Sparks (Standard Oil Development); *Secretary,* C. W. Haynes (Binney & Smith); *Treasurer,* C. W. Christensen (Monsanto). J. H. Fielding (Armstrong Rubber) is chairman-elect for 1951.

The following were nominated as directors representing various local groups: *Akron,* H. F. Palmer (Consultant) and Ralph Wolf (Columbia Chemical); *Boston,* J. C. Walton (Boston Woven Hose) and B. Capen (Tyer Rubber); *Buffalo,*

Charles Miserentino (Dunlop) and E. C. Siverson (Buffalo Weaving & Belting); *Chicago,* B. W. Hubbard (Ideal Roller) and Francis Frost (Frost Rubber Works); *Connecticut,* W. J. O'Brien (Seamless Rubber) and Ray Dudley (Whitney Blake); *Detroit,* G. P. Hollingsworth (Minnesota Mining) and George Wolf (Sharples Chemicals); *Los Angeles,* Ray Bitter (Goodrich Chemical) and A. F. Reznicek (Voit Rubber).

Also, *New York,* M. Buffington (Lea Fabrics) and J. J. DeMunnik (American Tile & Rubber); *Northern California,* G. S. Ramsey (Grove Regulator); *Philadelphia,* W. F. Abbey (Firestone) and R. Kurtz (DuPont); *Rhode Island,* F. W. Burger (Kleistone Rubber) and E. L. Hanna (Davol Rubber); *Southern Ohio,* R. A. Clark (Battelle Memorial) and G. H. McFadden (Ohio State); *Washington,* T. A. Werkenthin (Bureau of Ships) and Norman Bekkedahl (Bureau of Standards).

Plans for International Meeting

During the course of the business session, Dr. Staveley outlined some of the plans being made by the Rubber Division for the International Rubber Meeting to be held this fall. This meeting will be held in Cleveland, Ohio, on Wednesday, Thursday and Friday, October 11, 12 and 13. Headquarters will be maintained at the Hotel Cleveland and the divisional banquet at the Hotel Carter. Amos Oakleaf (Philblack) is chairman of the local arrangements committee.

It was announced that six technical sessions will probably be held, in the morning and afternoon of each day. Some 50 foreign technical organizations have been contacted and at least 15 papers have already been assured from overseas technologists. Delegates are coming from England, France, Italy, Australia and other countries. Many of these will also attend the International Meeting planned by Committee D-11 on Rubber Products of the American Society for Testing Materials, which will be held in Cleveland on Monday and Tuesday, October 9 and 10.

At least 20 delegates are coming from England, including the following: W. J. S. Naunton (I.C.I.), H. J. Stern (Consultant), G. Gee (B.R.P.R.A.), C. M. Blow (B.R.P.R.A.), Dr. Koch (B.R.P.-R.A.), R. S. Rivlin (B.R.P.R.A.), J. R. Scott (R.A.B.R.M.), R. C. W. Moakes (R.A.B.R.M.), G. Martin (London Advisory Committee for Research, Ceylon and Malaya), W. McG. Morgan (Monsanto), Fordyce Jones (Reliable Rubber), M. M. Heywood (Firestone), J. H. Carrington (Anchor Chemical), A. Cooper (Expanded Rubber), T. L. Garner (Wm. Freeman), J. A. Bidmead, I. J. Davies (Davies Tyre House), K. O. Lee, P. C. Oxborow, and Fred Denton, Jr. (Denton & Co.).

According to present plans, all of these delegates, whose trips have been approved by the Bank of England, will sail from England on the *Queen Mary* on September 22 and will leave for the return trip from Montreal on October 18. Many of those listed above will present technical papers at the meeting.

The delegates from England will be somewhat handicapped because of current monetary regulations existing in that country and accordingly the Executive Committee of the Division is planning to partially underwrite their stay in this country. The sum of $5,000 has been set aside from the Division's treasury for such purpose and will be expanded if necessary. It is hoped, however, that monies expended in this direction will be replaced by subscriptions received from companies in the field. This, too, is one of the problems faced by the new committee headed by Mr. Outcault.

It was announced that the Spring, 1951, Meeting of the Rubber Division would be held in Washington, D. C., and the Fall, 1951, Meeting in New York City. The latter meeting will be held in conjunction with the 75th Anniversary Meeting of the American Chemical Society which will be followed by the Sixteenth Conference of the International Union of Pure and Applied Chemistry and the Twelfth International Congress of Pure and Applied Chemistry.

All programs for the Anniversary Meeting of the A.C.S. will feature symposiums and Dr. Staveley will welcome suggestions for symposiums to be held by the Rubber Division. It was mentioned that the monograph on synthetic rubber sponsored by the Division will probably make its appearance shortly before the meeting and that a symposium on synthetic rubber might be most appropriate, with authors of various chapters participating. Because of the elaborate preparations being made for the Diamond Jubilee Meeting, it will be necessary for authors planning papers to furnish abstracts by January 1, 1951.

Divisional Banquet Held

The Divisional Banquet was held in the Grand Ballroom of the Book-Cadillac Hotel on Thursday evening, April 20, with approximately 725 in attendance. An exceptionally good program of entertainment was the highlite of the affair.

Prior to the presentation of the entertainment, Dr. Staveley introduced all of those seated at the head table, officers and directors of the Division and a few guests, and then expressed the thanks of the Division to the Detroit Rubber & Plastics Group for handling the details of the meeting. In turn, Dr. Staveley was presented with a portable radio by the Detroit group, with George Wolf (Sharples Chemicals) making the presentation.

All details at the Detroit meeting were very smoothly handled, with credit due to various members of the Detroit Rubber & Plastics Group. Mr. Wolf was general chairman of the Local Arrangements Committee, with the following in charge of various activities as indicated: *Registration,* G. F. Lindner (Minnesota Mining); *Finance,* G. R. Cuthbertson; *Banquet,* J. C. Dudley (Chrysler); *Meeting Rooms and Hospitality,* E. V. Hindle; *Publicity,* G. P. Hollingsworth (Minnesota Mining); *Plant Trips,* R. J. Shroyer (Vanderbilt); *25-Year Club,* Ed Kvet (Baldwin Rubber).

Others cooperating with the various chairmen named included F. H. Jankowski, E. S. Knoor, W. J. Simpson, C. J. Edwards, Jr., T. W. Halloran, H. W. Neale, E. W. Hafford, J. T. O'Reilly, W. F. Bauer.

A special showing of "A Study in Black," the new sound motion picture in full color made by Godfrey L. Cabot, Inc., which describes recent advances in the science and technology of carbon black, its manufacture and its uses, was held on Wednesday afternoon, April 19, following completion of the day's technical session. The showing was well attended.

Chips in Tire Treads

A tire company in Victoria, British Columbia, Canada, has equipped several taxis and its own trucks with a tread containing built-in hardwood chips to give traction either on snow or ice. Motorists who have used the tires say they are good for safe travel through snow two feet deep or on glassy ice. The tires are said to lessen the danger of skids and side slips. They wear away slightly faster than ordinary rubber tires, giving about 23,000 miles instead of 28,000.

RFC Offers Akron Synthetic Plant

A Government-owned synthetic rubber plant built in Akron in 1942 has been offered for sale or lease by the Reconstruction Finance Corp. Located on Archwood Avenue, the plant was operated by the Goodyear Tire & Rubber Co. during the war. It was shut down several years ago when supplies of natural rubber became more plentiful. RFC said the property consists of 19 buildings with 118,000 feet of floor space. The site includes 21.23 acres of land. It is served by the Baltimore and Ohio Railroad. Originally designed to produce 30,000 long tons of synthetic annually from butadiene and styrene, the facilities may be readily converted to industrial uses in the chemical and allied fields, RFC said. Bidders were notified that the pilot plant facilities located on one acre of land within the area of the main plant are not available for sale.

Wooster Rubber Plant Addition

Wooster Rubber Co., Wooster, Ohio, has announced the construction of new plant facilities, including a two-story structure with over 52,000 square feet of storage and shipping space. Last year, the company increased its production capacity by approximately 53%. Expansion of company facilities is in line with the rise in shipments of "Rubbermaid" housewares. In the first quarter of 1950, these shipments were 106% above the same period in 1949. The rise continues the rapid growth of demand for the company's products since the war, which last year resulted in an over-all increase of 84%. Sales in 1948 rose 58% over 1947.

LONDON SECTION OF IRI HOLDS RUBBER ENGINEERING CONFERENCE

On March 17, 1950, the London Section of the Institution of the Rubber Industry held a Conference on the Dynamic Properties and Testing of Rubber at the Overseas League Headquarters, St. James, London S.W. 1, England. The morning session comprised four papers on various aspects of the measurement of the dynamic properties of rubber. In the first of these papers, Mr. J. R. S. Waring (ICI) referred to the need for control of variables, such as mode of application of stress, temperature, static load, conditioning and form of test piece, frequency, and amplitude of vibration in the testing of the dynamic properties of rubber.

The speaker described what are probably the two most popular methods of measurement, using an electrical vibrator and a Roelig-type machine respectively, and compared experimental results for dynamic stiffness and hysteresis obtained on the two machines. He claimed that the results showed that the same properties were being measured by the two machines; this gave hope of standardizing testing procedures without necessarily specifying a particular testing machine.

Deformation After-Effects

L. Mullins (Ministry of Supply) pointed out some of the difficulties associated with the measurement of the dynamic properties of rubber and showed the importance of after-effects of previous deformation. He suggested that it was not yet possible to design a simple system of testing these properties which would enable them to be described in a clear and concise way. To ascertain the properties controlling the behavior of rubber under a particular set of conditions it was still necessary to measure them under these conditions instead of trying to deduce them from other measurements.

W. P. Fletcher and A. N. Gent (BRPRA) reported a careful investigation into the effects of frequency and amplitude of strain on the dynamic properties of rubber in shear. Measurements had been made, using an electrical vibrator, on a range of rubber compounds. The results showed that, although the properties of rubbers loaded with reinforcing black were influenced by previous straining, changes in amplitude of vibration, or static strain, pure gum rubbers were little influenced by such changes. This led to the interesting proposal that rubbers for engineering uses should not be compounded with highly reinforcing carbon blacks but with softer carbon blacks.

Dr. K. W. Hillier (ICI) completed the morning session with a description of a method for measuring the dynamic properties at high frequencies (in excess of 0.5 k.c./sec). He stated that in many applications of rubber high frequency components of deformation were present, and knowledge of the behavior of rubber at high frequencies was essential for a complete solution of design problems.

Some of the difficulties expressed in the morning session were resolved in the afternoon when R. S. Rivlin (BRPRA) showed that although it was not logically correct to apply the usual vibration equation to calculate values of the dynamic modulus and viscosity of rubber, the results were valid at any rate for vibrations of small amplitude. He presented a mathematical framework which could account for the observed dynamic properties of rubber, and gave hope to members of the audience who had begun to wonder whether the problem of the dynamic behavior of rubber was too complicated.

A. E. Moulton and P. W. Turner (George Spencer Moulton) traced the development of rubber springs, showing the steady improvement in their design, and the important consequences of the introduction of rubber-to-metal bonding. This contribution showed how a very high standard article had resulted from the continued application of empirical design.

A paper by S. G. Leontein (Sweden) completed the day's proceedings. Mr. Leontein was not able to attend the conference, but his contribution was abstracted and presented by J. M. Buist and G. E. Williams (ICI). Mr. Leontein's paper presented a comprehensive working theory for the calculation of the dynamic properties of rubber under a variety of conditions together with graphical methods for the determination of these properties.

Kel-F dispersions, a new product of the Chemical Manufacturing Division of the M. W. Kellogg Co., Jersey City, N. J., are being offered for industrial study so that they may be evaluated under actual commercial conditions.

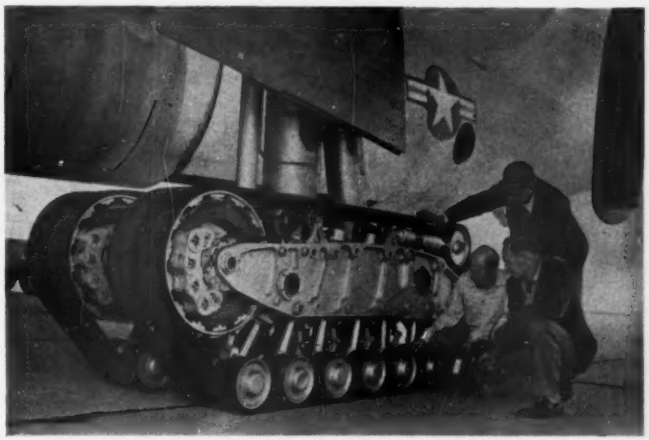
U. S. Rubber Textile Laboratory

U. S. Rubber Co. opened its new textile research and development laboratory at Winnsboro, S. C., on April 20. Dedication of the laboratory was marked by a series of special events for employees and residents of the area, beginning with a visit by a group of executives headed by Harry E. Humphreys, Jr., president of the company. Opening of the laboratory brings together a staff of more than 25 research men and women in a consolidation move designed to improve and expand the company's textile operations. Practically all of the company's textile research and development work will now take place at Winnsboro except research on asbestos products, which will continue at Hogansville, Ga., home of the company's Asbestos plant.

March Consumption Rises 12%

Estimated consumption of new rubber during March increased to 99,028 long tons from 88,329 long tons in February, an increase of 12.11%, according to the monthly report of the Rubber Manufacturers Association, Inc. Use of natural rubber in March was 61,008 long tons, an increase of 7.73% from February when 56,630 long tons were used. Consumption of synthetic rubbers also increased 19.94% to 38,020 long tons from 31,699 long tons the month before. Reclaimed rubber use was estimated at 22,222 long tons, 12.10% higher than the February tonnage of 19,824 long tons.

GOODYEAR CATERPILLAR-TYPE LANDING GEAR FOR HEAVY BOMBERS



The world's largest bomber, the B-36, is presently undergoing tests with a new caterpillar-type landing gear at Fort Worth, Texas. The rubber belt tracks, the single disc brakes (left) and the brake bogies were all manufactured by the Goodyear Tire & Rubber Co. The photograph depicts engineers inspecting one of the two main gears. Each belt is 16 inches wide, 275 inches in circumference and has a thickness of 1 inch except for an additional 1 inch "V" in the center which fits into the bogie wheel slot. The belting is reinforced with brass-plated steel cable. The track gear is designed for a maximum average of 57 pounds pressure per square inch in the landing strip, compared to a pressure of 156 pounds per square inch exerted by the conventional wheel-type gear on a B-36 at the same gross weight.

HOUSE ACTION IS ARRANGED ON PROPOSED RUBBER LEGISLATION

The Vinson bill which proposes to extend existing rubber legislation for another three years was cleared for floor action in the House by the House Rules Committee over the April 30 week-end. The committee granted a rule permitting an hour's general debate on the bill. The House then must vote, but approval is virtually assured. The bill (HR 7579) was reported out by the House Armed Services Committee on March 14.

Neither the industry nor the Administration likes the consumption control provisions retained in the Vinson bill or its freeze on the selling or leasing of government-owned synthetic rubber facilities. Although immediate floor consideration of the bill was not possible because of the number of measures crowding the calendar, House action is expected sometime this month.

Senator Lyndon Johnson (Dem., Tex.), chairman of the Senate Armed Services Subcommittee, will take up the Vinson bill in hearings expected about May 22. Senator Johnson is expected to send the House bill to the Senate without amendment. The Armed Services Subcommittee has also received a bill written by Senator Bricker (Rep., Ohio), which closely follows provisions suggested by the Goodyear Tire & Rubber Co.

Bricker Bill Provisions

The Bricker Bill centers all rubber authority with the President, even giving him the right to limit imports of rubber goods so as to assure the quality of those produced in the United States. It also keeps controls on how much synthetic must be used in tires, this amount to be revised downward every six months during the three-year life of the law.

The bill further provides for the leasing of synthetic plants, the sale of those now declared surplus, and the eventual disposal of the whole operation to private industry. It also continues Government encouragement of synthetic research with the stipulation that no operator leasing a plant would have to share technical discoveries with the rest of the industry.

Other terms call for the stockpiling of GR-S along with natural rubber and the keeping of enough GR-S producing capacity to turn out 600,000 long tons of rubber a year if the need arises. The minimum amount of GR-S that would have to be produced and used every year would be 200,000 tons.

In the proposed legislation also is a section setting forth penalties, fines stopping at $10,000 and up to two years in prison for violation of the various provisions. The Bricker Bill would run three years from the expiration of the present Rubber Act, or until June 30, 1953.

On the eventual disposal of synthetic facilities it recommends that a report by Government rubber planners be submitted to the President no later than July 1, 1952. By February 15, 1953, the President, after consulting with the National Security Resources Board, would make disposal recommendations to Congress.

Forms Hydrocarbon Chemical Corp.

Final arrangements have been completed for the organization of the Mathieson Hydrocarbon Chemical Corp., a joint venture of the Mathieson Chemical Corp. and the Tennessee Gas Transmission Co. The new firm will produce a number of chemicals from natural gas. Over 2,000 acres of land have been acquired near Brandenburg, Ky., for the construction of chemical units at a cost of $17,000,000. The company will also build a $6,000,000 plant for the production of raw materials elsewhere. Tennessee Gas is building a $12,000,000 stripping plant near Greensburg, Ky., which will take the hydrocarbon chemicals to be used in the new plant out of natural gas. A pipeline will be built to take them to the chemical plant. It is understood that one of the products will be ethylene glycol.

Seventh Annual SPE Conference

Plans are under way for the Seventh Annual National Technical Conference of the Society of Plastic Engineers, Inc. The Conference will be held on January 18-20, 1951, at the Hotel Statler in New York City, and is being sponsored jointly by the New York and Newark Sections of the Society. The Conference will feature the presentation of technical papers on the latest developments in plastics materials, processing and fabricating techniques, tools and equipment, and applications. Open to all persons in the plastics and related industries, the Conference is expected to attract an attendance of 1,000 technologists drawn from all parts of the United States, Canada, Mexico, and many foreign countries. Details may be secured from the Society at 409 Security Bank Building, Athens, Ohio.

Stalwart's 30th Anniversary

The Stalwart Rubber Co. of Bedford, Ohio, is celebrating the 30th anniversary of its founding, this year. Thirty years ago, Herman W. Osborn, founder, president and treasurer of the company, began the manufacture of rubber heels for shoes. He set up operations in the family barn and acquired six employees and two hand presses. Today, the company employs over 200 persons and supplies rubber parts to all 48 states and abroad. These products find use in the automotive, aircraft, instruments, machinery, household appliances, and other industrial and consumer items.

G-E Maxiservice X-Ray Plan

A new service plan that will enable industry to cut costs, perform research and control quality, without investing in equipment, has been announced by the General Electric X-Ray Corporation. Industry will be offered not only an X-Ray apparatus, but a "packaged" X-ray service, complete with equipment, maintenance, repair parts, tubes and instruction, all covered by one monthly charge. The plan is known as "Maxiservice." Additional information on the service may be obtained by writing the company at 4855 Electric Avenue, Milwaukee 14, Wisc.

SALE OF NORWALK TIRE CO. APPROVED BY FEDERAL COURT

The United States District Court at New Haven, Conn., on April 27 approved the sale of the Norwalk Tire & Rubber Co., of Norwalk, Conn., to the Aetna Industrial Corporation of New York, subject to confirmation by creditors and holders of stock and debentures of the company. The Aetna bid amounted to $2,550,000. Norwalk Tire is currently being operated under the trusteeship of Wallace DeLaney.

The Aetna Industrial Corporation is understood to be a holding company with several manufacturing divisions or subsidiaries, among these being the Trimount Manufacturing Co., Oscar Heineman & Co., and the Utility Construction Co. Walter Weismann is president of the concern. No report is available as to Aetna's intentions, but it is expected to continue normal Norwalk operations. Pending approval of the purchase, Norwalk will continue to operate with its current working force of 250.

Various plans for reorganization of Norwalk Tire were submitted at hearings held in New Haven on April 3 and 17. At the latter hearing, Aetna Industrial submitted a bid of $2,300,000 for operation of the company under joint management with the trustee, Mr. DeLaney. The increased bid of $2,550,000, which was approved by the court on April 27, did not involve such joint operation.

Original Aetna Plan

The original Aetna plan was described as providing for every class of creditor and included proposals that 70% of the face value of bonds and claims be made with a 6% interest payment also being made on debentures and general creditor claims. An Armstrong Rubber Co. proposal, also made on April 17, offered a bid totaling about $2,280,000, of which $1,020,000 would be in cash with the remainder in bonds of the company.

Most of the court proceedings of the day were taken up with cross-examination of Elliott C. Simpson, a stockholder in Norwalk Tire. Mr. Simpson's plan called for Reconstruction Finance Corp. loans of $1,250,000 and involved the naming of a new board and new directors. Mr. Simpson claimed that he could have the company operating efficiently in two or three months.

Other plans for the company, which had been submitted at the first hearing on April 3, called for the sale to the highest bidder and a reorganization on the basis of two RFC loans of $850,000 and $400,000. The trustee's plan that the assets be sold to the top bidder brought a bid of $2,150,000 from Sidney G. Rose of Cincinnati, Ohio, who said his offer was for the purchase of the company's assets. Acme-Hamilton Co. of Trenton, N. J., offered a $2,000,000 bid with an offer of 5% of new stock to stockholders.

Dozens of Polyken industrial tapes for hundreds of different jobs are described in a new booklet issued by the Bauer & Black Division of the Kendall Co., Chicago 6, Ill.

GOVERNMENT STOCKPILING URGED BY THE CARBON BLACK INDUSTRY

According to the Washington Bureau of the New York *Journal of Commerce*, the carbon black industry has warned the Government that declining markets and the siphoning off its most important raw material—natural gas—by the higher-paying chemicals and gas-pipeline industries will force it into permanent shutdown of 20 per cent of its capacity this year. The Munitions Board, which has turned away the industry before, is now showing interest. Well on its way to filling a 600,000 ton rubber stockpile goal, the board knows it cannot put the rubber in military tires without carbon black.

The industry has asked the board to to start stockpiling channel-type carbon black, one pound for each two pounds of rubber it buys. The industry is producing 50,000,000 pounds of channel a month, selling 40,000,000 and wants the Government to buy the other 10,000,000 before producers retrench production to fit their market.

The National Security Resources Board, charged with gearing American industrial planning for war, will launch an "exhaustive" study of the industry's problems to decide whether strategic stockpiling of channel black is necessary. Harry Titus, president of the Carbon Black Export Association, New York, engineer and attorney, has received an NSRB appointment to head up the study.

As Industry Views Problem

The Texas industry is rapidly losing its cheap gas suppliers to the State's budding chemicals industry. National gas is being pre-empted by higher-paying pipelines which feed to home and industrial users in the North and soon to the West Coast. Its markets, led by a sharp fall in exports, are rapidly contracting. Production of channel this year is expected to drop to 580,000,000 pounds from 627,000,000 last year and 676,000,000 a year earlier.

Once the gas enters pipelines, it will never return to channel black. Producers cannot continue producing beyond sales much longer. This is because gas suppliers want cash. They will no longer sell gas to carbon-black producers on a royalty basis, which before the war permitted producers to stockpile 125,000 tons of unsold black.

The highly-touted new furnace blacks, using high-grade aromatic distillate oils, are also meeting competition as raw materials for other products. Furnace black, in any case, scorches natural rubber, which the Government is stockpiling. It is very good for toughening "cold" synthetic rubber, but cold-rubber capacity is only 185,000 tons a year, against wartime rubber needs of 1,000,000 tons.

About 875,000,000 pounds a year of channel black would be needed to process rubber hydrocarbon in wartime, 300,000,000 more than today's productive capacity and more than the industry's peak wartime output. The nation cannot afford to let 120,000,000 pounds annual production go by the board, the industry says.

Coming Events

May 23. Washington Rubber Group, Cosmos Club, Washington, D. C.
June 3. Southern Ohio Rubber Group, Annual Outing.
June 6. Akron Rubber Group, Outing, Firestone Country Club, Akron.
June 15. New York Rubber Group, Annual Outing, Doerr's Grove, Milburn, N.J.
June 16. Akron Rubber Group, Annual Outing.
June 16. Boston Rubber Group, Annual Outing, United Shoe Country Club, Beverly, Mass.
June 16. Quebec Rubber & Plastics Group, Annual Golf Tournament.
June 17-18. Los Angeles Rubber Group, Outing, Del Mar Hotel, Del Mar, Calif.
June 19-22. A.S.M.E., Semi-Annual Meeting, St. Louis, Mo.
June 23. Detroit Rubber & Plastics Group, Annual Outing, Forest Lake, Mich.
June 26-30. A.S.T.M., Annual Meeting, Chalfonte-Haddon Hall, Atlantic City.
July 14. Buffalo Rubber Group, Annual Outing.
July 28. Chicago Rubber Group, Outing, Medinah Country Club, Chicago.
Sept. 3-8. A.C.S., 118th National Meeting, Chicago, Ill.
Sept. 14. Southern Ohio Rubber Group, Engineers Club, Dayton.
Sept. 19-21. A.S.M.E., Fall Meeting, Worcester, Mass.
Oct. 6. Detroit Rubber & Plastics Group, Detroit-Leland Hotel, Detroit.
Oct. 9-10. A.S.T.M. Committee D-11 on Rubber Products, International Meeting, Cleveland.
Oct. 11-13. Rubber Division, A.C.S., International Rubber Meeting, Hotel Cleveland, Cleveland.
Oct. 20. N. Y. Rubber Group, Henry Hudson Hotel, New York.
Oct. 20. Boston Rubber Group, Somerset Hotel, Boston.
Nov. 26-Dec. 1. A.S.M.E., Annual Meeting, New York, N.Y.
Dec. 8. Detroit Rubber & Plastics Group, Xmas Party, Detroit-Leland Hotel, Detroit
Dec. 15. N. Y. Rubber Group, Xmas Party, Henry Hudson Hotel, New York.
Dec. 15. Boston Rubber Group, Xmas Party, Somerset Hotel, Boston.

Hewitt Institute Demonstrations

Hewitt Comfort Institute of Hewitt-Robins, Inc., has begun a series of demonstrations in the Midwest on the manufacture of Restfoam rubber cushioning. This and other talks now being scheduled for spring household promotions at stores throughout the central states, will demonstrate to housewives the strides taken in the field of latex foam rubber as a household padding material.

NEW RUBBER CONSUMPTION IN 1950 8% OVER FIRST QUARTER OF 1949

United States consumption of new rubber totalled 280,812 long tons in the first quarter of 1950, an increase of 20,722 tons or 8.0 percent over the first quarter of 1949, the U. S. Department of Commerce reported recently. New rubber consumption in March of this year totalled 98,414 tons, according to preliminary statistics, and was the highest for any month since January, 1948, when consumption amounted to 100,711 tons. March consumption increased 9,974 tons or 11.3 percent over February and 6,465 tons or 7.0 percent over March a year ago.

March consumption of U. S. Government GR-S totalled 26,067 tons, an increase of 4,503 tons or 20.9 percent over February. Consumption of natural rubber amounting to 60,809 tons (including latex), showed a smaller increase—4,229 tons or 7.5 percent—over the February figure. As a result, the ratio of U. S. Government GR-S consumption to total natural plus Government GR-S increased to 30.0 percent in March, interrupting a continuous decline which had carried the ratio from 35.4 percent last August to 27.6 percent in February.

Natural Latex Consumption

March consumption of natural latex was a record 4,258 tons, up 6.6 percent from the previous high of 3,993 tons posted in February. Latex imports amounting to 3,650 tons fell short of consumption by more than 600 tons and reported stocks of latex declined from 5,245 tons at the end of February to 4,571 tons supply at the March rate of consumption, an all-time low.

Consumption of S-type synthetic other than Government GR-S amounted to 2,399 tons in March. Neoprene consumption of 3,508 tons was the highest since March 1947. Use of butyl was at a nine-months' high of 4,765 tons. N-type consumption was calculated at 866 tons.

Consumption of reclaim amounted to 22,286 tons in March, the highest since October, 1948, when 22,451 tons were used. The ratio of reclaim consumption to total new rubber consumption rose to 22.6 percent in March from 22.3 percent in February.

Natural rubber imports, including latex, totaled 61,481 tons in March and total natural rubber stocks available to industry declined to 101,898 tons at the end of the month compared with 104,477 tons at the end of February.

Production of synthetic rubber totaled 33,003 tons in March against 29,336 tons in February and consisted of 23,765 tons of U. S. Government GR-S, 6 tons of privately produced S-type, 4,572 tons of butyl, 3,516 tons of neoprene, and 1,144 tons of N-type.

Synthetic rubber stocks at the end of March included 66,535 tons of GR-S and S-type, 12,213 tons of butyl, 4,864 tons of neoprene, and 3,337 tons of N-type. Such stocks at the end of February, in the same order, were: 68,500 tons, 11,952 tons, and 3,307 tons.

RUBBER SAFETY AWARD WINNERS ANNOUNCED BY SAFETY COUNCIL

The National Safety Council, Chicago 6, Ill., has announced the award winners of the Rubber Section Safety Contest for 1949. The experience of 122 plants is shown in the final standings, including three with below-minimum exposure and three with only eleven months' experience. This is four more than the number in the previous contest. Man-hours reported in the contest totaled 289,000,000, a decrease of 6% over those reported in the previous contest. The number of disabling injuries, however, was down 20%.

The cumulative rate for all contestants dropped to 4.82 from 5.73 in the previous contest, a reduction of 16%. However, for just those plants reporting in both this contest and the previous contest the rate was down 15%.

The rate of 4.82 for all contestants was 42% below the national average of 4.35 for all rubber plants reporting their experience to the National Safety Council in 1948. Twenty-three plants, including three with below minimum exposure, completed the contest with perfect records. Eight plants earned Certificates of Achievement, five for reducing injuries, and three for having perfect records, although below minimum exposure.

The rules of the contest divide the reporting plants into five different divisions depending upon average monthly manhours. Division I included those plants with over 400,000 average monthly manhours; Division II, 200,001 to 400,000; Division III, 100,001 to 200,000; Division IV, 50,000 to 100,000; and Division V, under 50,000.

The winners in Division I, which had an average frequency rate of 3.63 for 1949, included: (1) U. S. Rubber Co., Mishawaka Plant, with a frequency rate of .72; (2) Firestone Tire & Rubber Co., Akron Plant No. 1, with a frequency rate of .99; and (3) Firestone Tire & Rubber Co., Akron Plant No. 2, with a frequency rate of 1.26.

Winners in Division II included: Goodyear Tire & Rubber Co., Cumberland, Md., plant, with a frequency rate of 1.02; Firestone's Pottstown, Penna., plant, with a frequency rate of 1.27; and U. S. Rubber's Indianapolis plant, with a frequency rate of 1.67.

Division III winners included: B. F. Goodrich Co., Miami, Okla., plant, the Woonsocket plant of U. S. Rubber, and the Waco plant of General Tire & Rubber, all with perfect scores.

Winners in Division IV, all with perfect scores, included the Houston, Texas, plant of the Goodyear Synthetic Rubber Corp., the Buffalo plant of the U. S. Rubber Reclaiming Co., and the Naugatuck, Conn., plant of U. S. Rubber.

Division V winners, all with perfect scores, included: General Laboratories of U. S. Rubber at Passaic, N. J., the Akron Reclaim plant of the B. F. Goodrich Co., the World Bestos Corp. Division of Firestone at New Castle, Ind., University of Akron, Xylos plant of the Firestone Tire & Rubber Co. of Calif., the Akron Research Laboratories of Firestone, the Du Bois plant of the B. F. Goodrich Co.

Distributes Rubber Dollars

U. S. Rubber Co., New York 20, N. Y., has employed a novel device to bring some interesting facts to company employees. The latest issue of the company magazine, *Us*, included a rubber dollar. This dollar, while having no monetary value, gave employees financial facts about the company as part of a broad information program. The dollar shows how the company spent the money it earned during the past year. It showed, for example, that 57½ cents out of every dollar went for materials and services, including crude rubber, textiles, chemicals, insurance, fuel and transportation. The second largest item of expense, employees' pay and benefits, took 35½ cents out of every dollar. Benefits included such things as unemployment compensation, social security taxes, retirement and disability allowances and paid vacations and holidays. Other expenditures were: 2½ cents for wear and tear, 1½ cents for federal and foreign income taxes, 2 cents for dividends to stockholders, and 1 cent for profit which was plowed back into the business. The rubber "money" was cut from lightweight sheeting the company makes for baby pants and other articles.

Also, Canadian Lastex, Ltd., Montreal, Que., Canada., National Automotive Fibres, Inc., Trenton, N. J., the Manchester plant of U. S. Rubber, the South Gate, Calif., plant of the Armstrong Cork Co., U. S. Rubber's Burlington plant; the Akron Retread Shop of Firestone Tire & Rubber Co., and the Fabric Fire Hose Co. of Sandy Hook, Conn.

Certificates of Achievement for the greatest numerical reduction in injury rate by division were awarded to the following: Division I, Plant 1 of the Goodyear Tire & Rubber Co.; Division II, Goodyear's St. Mary's, Ohio, plant; Division III, Goodyear's Topeka, Kansas, plant; Division IV, Goodyear's Lincoln, Nebraska, plant; and Division V, the New Toronto plant of the Flintkote Co. of Canada, Ltd.

Certificates of Achievement for perfect records working less than 72,000 manhours during the contest were awarded to the following: Roth Rubber Co., Cicero, Ill., Lobl Manufacturing Co., Middleboro, Mass., and the Synthetic Rubber Division of the U. S. Rubber Co. at Institute, W. Va. The latter is an agent for the Office of Rubber Reserve of the Reconstruction Finance Corp.

Thiokol Seeks Curb Listing

Thiokol Corp., Trenton, N. J., will soon apply for listing on the New York Curb Exchange. Directors recently approved the decision to apply for such listing. At the end of 1949, the company had 306,000 shares of stock outstanding.

ASA ISSUES NEW STANDARDS FOR RUBBER PROTECTIVE EQUIPMENT

Four new specifications for rubber protective equipment used by electrical linesmen have been approved as American Standards by the American Standards Association, New York, N. Y. They cover insulator hoods, blankets, sleeves, and line hose. These standards were developed by a committee of 15 national organizations sponsored by the American Society for Testing Materials and the Edison Electric Institute under the procedures of the American Standards Association. The fact that rubber and compounding materials of prewar high quality are again available brought about the preparation of this new standard which replaces a 1945 wartime edition.

One of the principal changes is an increase in tensile strength. For both insulating hoods and line hose the minimum limit for tensile strength has been increased from 1200 psi to 1600 psi; for insulating blankets from 1400 psi to 2500 psi, while for the insulating sleeves the increase is from 1800 psi to 2500 psi.

Correspondingly, the elongation and set have both been changed in the new edition. For example, in the case of the line hose and insulator hoods the elongation at rupture has been changed from not less than 400 percent in 2 inches at rupture (2 inches stretched to 10 inches) to not less than 350 percent in 2 inches at rupture (2 inches stretched to 9 inches) while the set in 2 inches following an elongation of 150 percent (2 inches stretched to 5 inches) has been changed from a maximum of 0.5-inch to 0.25-inch.

The wartime specifications contained the safe working voltage (volt rating) as part of the title of each standard. However, as the safe working voltage varies under different climatic conditions it was decided to replace the "volt rating" with the phrase "Proof test 10,000 volts, 3 minutes," for example, to indicate that this is the test voltage under laboratory conditions.

Wherever possible, the standards now permit the use of water electrodes for making dielectric tests on rubber protective equipment as well as previously specified metal electrodes.

Seiberling Flex-Arc Pattern

Seiberling Rubber Co., Akron, Ohio, has announced the development of a new design principle in the manufacture of low-pressure tires which is said to put more of the tire to work. In this system, the low-pressure tire is re-contoured into what the company calls a "flex-arc" pattern. This adds rubber at the tire shoulder to spread the flexing area, the point where the tire bends, over a much wider area than before. In this way, more of the tire cords share the work of supporting the load. Company officials state that tests have shown the new design tires resist abuse much better than the low pressure tires previously produced. The new "flex-arc" design will be used in the company's "Safety" tire and in its premium quality "Safe-Aire" tire.

MORE POWER TO AMERICA SPECIAL UNVEILED BY GENERAL ELECTRIC

The General Electric Co. unveiled its 10-car More Power to America Special to press and radio representatives in New York on April 24. Termed the "biggest electrical display kit ever built," the train is almost a quarter-mile long and represents the first attempt to display, in one series of related exhibits, the complete range of products made by the company for the production, distribution and industrial utilization of electric power. Some 2,000 products are covered.

The More Power to America Special, prepared and launched by the company's Apparatus Department, will visit approximately 150 key industrial centers during 1950 and 1951. At each stop it will be visited and inspected by invited representatives of electric utilities, the manufacturing and transportation industries, the armed services, the federal government, and municipalities. The train will not be open to the general public.

Exhibits in the "Special" are grouped in 11 major sections: Power Generation, Transmission, and Distribution; Drives and Controls, Materials Handling, Welding, Industrial Heating, Renewal Parts, Industrial Lighting, Components for Industry, Measurements, Civic Improvement, and National Security.

Arrayed throughout the train are displays covering the complete range of apparatus for industry. Individual exhibits, many of them operating, cover such equipment as turbines, substations, transmission equipment, motors of all sizes and ratings, complex drive systems, industrial and street lighting fixtures, precise instruments, welding and heating equipment, diesel-electric switchers, controls, urban transit and railroad equipment. Still others relate to atomic power, weather research, guided rockets, aircraft jet engines, ultrasonics, ship propulsion equipment, fire control systems, and "snow-making" techniques.

Exhibits of Special Interest

The Drives and Controls section of the "Special," which will prove of special interest to the rubber manufacturing industry, occupies one and a half cars. Solutions of control problems involved in production and inspection of various industries, including rubber, are shown in one exhibit of this section—an arrangement in which controls of speed, quality, tensions, thickness and acceleration are demonstrated.

This exhibit consists of the continuous moving of a 21 foot long steel strip, six inches in width, over a series of rollers. High acceleration and fast braking are provided by an amplidyne controlled d-c drive. Tension, direction of rotation and speed of the reversible strip, which may range from 60 to 1500 feet per minute, can be controlled by the visitor. Thickness is indicated by the new beta ray thickness gage. A pin-hole detection unit flashes a signal when a hole in the strip passes it.

Adjustable speed drives, moisture monitoring and two types of loop control are demonstrated in another display which features the operation of a 21 foot long, two-foot wide cloth belt between a series of rollers. The continuous cloth web is driven by an adjustable speed gear motor.

Correct tension is maintained by either a photo-electric scanner or a loop positioning solenoid, depending upon which control is selected by the visitor. Varying cloth speeds are detected by either of these devices and a corrective signal is sent to the Thymotrol (R.) drive, which changes its speed to bring the loop length back to the pre-set position. The moisture monitor, which indicates variations of moisture in the web, operates independently.

Industrial Heating Display

The multitude of ways in which electric heat can be used by industry to increase production, reduce costs, and improve product quality are visualized in the Industrial Heating section. Some typical heating operations which can best be performed by dielectric heating equipment are shown pictorially in this section, including the preheating of plastics.

More than 250 different instruments for recording, controlling, measuring, etc., are on display, most of these being exhibited in the Measurements section. These include one-operation and cyclic process timers for controlling molds and presses, spectrophotometers to speed matching colors and controlling production, d-c selsyn systems which give remote indication of position, surface roughness scales used to specify finishes, thickness gages, vibration meters, etc.

The train and its objectives were described in detail by company executives at a special luncheon. Speakers included Henry V. Erben, vice-president and general manager of the Apparatus Department; Chester H. Lang, vice-president in charge of apparatus sales; J. Stanford Smith, manager of the advertising and sales promotion divisions of the Apparatus Department and Clayton P. Fisher, Jr., manager of the Apparatus Exhibit Train Division.

American Cyanamid Export Unit

American Cyanamid Co., New York 20, N. Y., has formed the Dyes and Chemicals Export Department to handle all foreign activities in connection with the products of the company's Calco Chemical Division, Industrial Chemicals Division, and Plastics and Resins Division. The combined department will be under the direction of Fraser M. Moffat, Jr. H. E. Lorenz has been appointed manager, and J. C. Martin, assistant manager of the Eastern Hemisphere and all activities in that area. J. L. Clark, formerly export sales manager of the Calco division, has been assigned to special duties under Mr. Moffat. Products handled by the new department include rubber chemicals, dyes and pigments, heavy chemicals and industrial chemicals for the paper, leather and other industries.

Goodrich Belt Plant Opens

Production in the new $5,000,000 belt plant constructed by the B. F. Goodrich Co. in Akron, Ohio, began on April 3. Full production in the building is expected by fall. Work started on the multi-million dollar plant in the fall of 1948. Four old buildings were torn down to make way for the new structure. H. L. Dixon, formerly production superintendent of the Industrial Products Department, has been named to the newly-created position of Manager of Belting and Matting.

K. H. Runkle, manager of the Industrial Divisions of the Apparatus Department of the General Electric Co., is shown examining one of the operating drive systems in the Drives and Controls section of the More Power to America Special. In this display, speed, quality, tension, thickness, and acceleration controls are exhibited.

NAMES IN THE NEWS

THOMAS ROBINS, JR., president of Hewitt-Robins, Inc., has been elected board member designate of the National Industrial Conference Board to represent the Rubber Manufacturers Association.

WARREN H. HACKETT, assistant treasurer of the B. F. Goodrich Co., has been named to the board of directors of the Akron (Ohio) Automobile Club.

FREDERICK T. KOYLE, associated with Carl M. Loeb, Rhoades & Co., New York, has been elected to the board of governors of the Commodity Exchange, Inc., to represent the rubber group. He fills the vacancy created by the recent death of AAGE BENDIXSEN.

RALPH E. KAYE, JR., formerly associated with the Atlas Powder Co., has joined the Alrose Chemical Co., of Providence, R.I., as mid-west sales representative. He will make his headquarters in Chicago.

HERMAN R. THIES, manager, Chemical Division, Goodyear Tire & Rubber Co., Akron, has been elected as a director of the Society of the Plastics Industry, Inc.

C. A. "CABBY" BARTLE, sales manager of the DuPont Rubber Chemicals Division, was married to Mary Lucre Layman on April 22 at the Church of the Sacred Heart in Wilmington, Delaware.

ROBERT H. KITTNER, formerly vice-president of the Glenn L. Martin Co. in charge of the Chemicals Division, has joined the Industrial Rayon Corp. as production manager.

CHARLES E. FREDRICKSON, formerly associated with the General Cable Corp. at St. Louis, Mo., has joined the Kaiser Aluminum & Chemical Co., Newark, Ohio, as superintendent of the Neoprene Department.

E. B. "CURLEY" CURTIS, sales executive of the R. T. Vanderbilt Co., who badly injured his shoulder in a fall several months ago and who has been laid up for some time, has returned to active duty at the office.

ISAAC DROGIN, director of research of the United Carbon Co., who was injured in an automobile accident in Akron last month, is up and around and has dispensed with the use of a cane.

CHARLES A. WALMSLEY, associated with the Cameron Machine Co., Brooklyn, N. Y., since 1949, and EDWIN P. STEVENS, partner in the law firm of Winthrop Stimpson, Putnam and Roberts, of New York City, have been elected to the board of directors of Cameron Machine.

JOHN H. DREXLER, formerly with the Philadelphia district office of the Carbide and Carbon Chemicals Division of the Union Carbide and Carbon Corp. as a technical representative, has been transferred to the Boston district office.

WILLIAM P. SEIBERLING, secretary of the Seiberling Rubber Co., was recently elected a director of the company.

WALTER S. RAYMER, JR., credit manager of the Sun Rubber Co., Barberton, Ohio, has been elected assistant secretary-treasurer and office manager of the company.

FRED O. THORNTON, associated with the U. S. Rubber Co. since 1925, has been appointed sales manager of drug sundries, water wear and specialties, succeeding CLIFTON M. BAYLISS, who has been transferred to Detroit as district sales manager of general products.

L. E. GRESSINGH, formerly associated with Gas Atmospheres, Inc., of Cleveland, recently joined the Dasher Rubber & Chemical Co., Fairport, Ohio, as works manager.

C. H. SIGLER, JR., formerly located in the Detroit office of the Naugatuck Chemicals Division of U. S. Rubber Co., has been transferred to the division's branch office in Chicago. He is technical representative on latex and coatings.

HERBERT E. SMITH, chairman of the board of the U. S. Rubber Co., has again been appointed to serve as chairman of the Rubber Division of the Greater New York Fund campaign.

LOUIS J. WOOLF, formerly executive vice-president of H. Kohnstamm & Co., Inc., New York, N. Y., has been elected president and treasurer of the company succeeding the late LOTHAIR S. KOHNSTAMM.

BOYD BRIDGWATER, vice-president of the Bridgwater Machine Co., Akron, Ohio, has been named to the Akron-Canton Airport Board of Trustees by the commissioners of Summit County.

NORMAN C. NAYLOR, formerly vice-president of the Union Asbestos and Rubber Co., has been elected president of the company succeeding JAMES S. WATTERS, who was elected chairman of the board.

REGIS W. HIGGINS, associated with the U. S. Rubber Co. since 1939, has been appointed assistant sales manager of golf balls for the firm.

JOHN L. COLLYER, president of B. F. Goodrich, has been awarded the honorary degree of Doctor of Commercial Science by New York University.

J. ALBERT WOODS, director of the Commercial Solvents Corp., and an officer and director of many other firms, has been elected president of the company, succeeding the late HENRY E. PERRY.

CLARENCE M. KING, formerly assistant treasurer and assistant secretary of the Minnesota Mining and Manufacturing Co., has been named treasurer of the firm. He will continue as assistant secretary.

KENNETH VANDENBREE, formerly director of sales for John Royle & Sons, and who recently joined the Standard Machinery Co., Mystic, Conn., has been appointed assistant sales manager of the latter firm.

LOUIS F. WEYAND, vice-president in charge of the Adhesives and Coatings Division of the Minnesota Mining and Manufacturing Co., has been elected to the board of directors of the company.

WESLEY M. GRAFF, associated with the U. S. Rubber Co. since 1942, has been appointed assistant superintendent of safety for the company.

WALLACE C. MANVILLE, former manager of the Tire Engineering and Service Departments of U. S. Rubber Co., has been named resale representative for the Denver, Col., district of A. Schrader's Son Division of the Scovill Manufacturing Co.

ALBERT S. BUXBAUM, president of the Buxbaum Rubber Co., has been named "Man of the Year" by Temple Israel in Akron, Ohio, for his services to the Jewish community of that city.

B. E. BENSINGER, II, has been elected president of the Brunswick-Balke-Collender Co., succeeding his brother, R. F. BENSINGER, who became chairman of the board.

DR. JOHN H. DILLON, member of the faculty of Princeton University and director of research of the Textile Foundation and the Textile Institute, has been named director of all operational functions of the Textile Research Institute, Inc.

W. T. HACK, who has spent the past two years in Washington as director of chemicals and the Rubber Division of the National Security Resources Board, has returned to the Ethyl Corporation in New York.

HARVEY S. FIRESTONE, JR., chairman of the board of the Firestone Tire & Rubber Co., has been chosen as one of the country's twenty top industrialists selected to set up an Episcopal Church Foundation in order to provide greater material resources to the work of the church.

J. RAMSEY, formerly assistant chemist for Gutta Percha & Rubber Ltd., Toronto, Ont., Canada, has joined the Miner Rubber Co., Ltd., Granby, Que., Canada, in charge of laboratories.

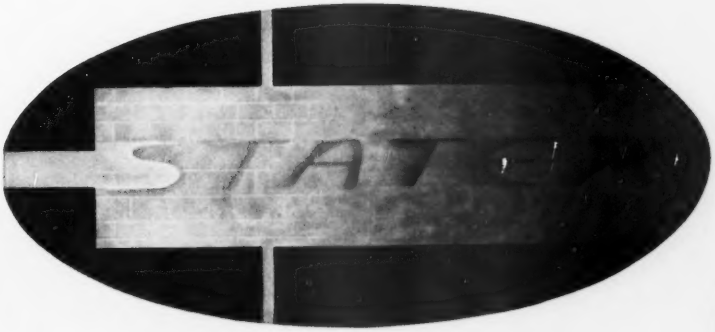
now...

...with the addition of

- STANDARD MICRONEX
- MICRONEX W-6
- STATEX-K
- HAF (High Abrasion Furnace) STATEX-R
- STATEX-B
- STATEX-M
- STATEX-93
- FURNEX

the most complete group of rubber blacks in the industry!

for data on STATEX-R please turn the page ➧



COLUMBIAN COLLOIDS

COLUMBIAN CARBON CO. MANUFACTURER · **BINNEY & SMITH CO.** DISTRIBUTOR

STATEX·R

IN A COLD RUBBER COMPOUND

(Factory Processed)

	Statex-R	Average HAF
Modulus @ 300% psi	1500	1520
Tensile psi	3450	3450
% Elongation	555	545
Shore Hardness	59	58
% Rebound	59.5	61.0
Log R	3.8	6.2
Road Wear Rating	109	100

STATEX-R is interchangeable with other HAF blacks .... with the added advantages of:

1. **BETTER ROAD WEAR**
2. **LOWER LOG R, WHICH MEANS ANTI-STATIC TREADS**

COLUMBIAN CARBON CO. • **BINNEY & SMITH CO.**

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FINANCIAL NEWS

Anaconda Wire & Cable Co.

For 1949: Net income of $3,734,528, which is equal to $4.42 each on 843,962 capital shares, compared with $7,009,136, or $8.30 on an equal number of shares, in 1948. Balance sheet items of the company as of December 31, 1949, indicated current assets of $29,517,448 and current liabilities of $7,555,738, against $31,603,-268 and $10,521,892, respectively, the year before.

Allen Industries, Inc.

First Quarter: Net profit of $294,580, which is equal to 53 cents each on 559,200 capital shares, against $254,251, or 45 cents each on an equal number of shares in the first quarter of the preceding year. Net sales in the first quarter of 1950 totaled $7,337,731, compared with $6,242,708 in the first quarter of 1949.

Hewitt-Robins, Inc.

First Quarter: Net income of $127,875, which is equal to 46 cents a common share on sales of $4,460,713, compared with $219,805, or 79 cents per common share on sales of $5,333,619, for the corresponding period of 1949.

O'Sullivan Rubber Corp.

For 1949: Net loss of $63,248 after income tax credit, contrasted with a net income of $83,206 in 1948 after taxes. Net sales of the company during 1949 were $3,969,000, a gain of 31% over the 1948 sales volume of $3,026,000.

Detroit Gasket & Mfg. Co.

For 1949: Net income of $530,649, which is equal to $1.01 a common share on net sales of $18,794,962, compared with the 1948 net of $1,363,923, or $2.60 a share on sales of $21,324,563.

Dewey & Almy Chemical Co.

First Quarter: Net profit of $214,071, which is equal to 67 cents a share on net sales of $3,908,382, compared with a net profit of $22,127, in the corresponding period of 1949.

Richardson Company

For 1949: Net income of $785,857, which is equal to $3.93 a share, against $1,675,-742, or $8.38 a share, in 1948.

Vulcanized Rubber & Plastics Co.

For 1949: Net income of $15,650 on sales of $2,466,830. Comparison with 1948 figures is unavailable.

Intercontinental Rubber Co.

For 1949: Net loss of $648,582, on sales of $71,343, compared with a net loss of $1,283,333, on sales of $138,576, after a $904,161 provision for shrub cultivation advances in 1948. The comparative consolidated balance sheet for the company and subsidiaries as of December 31, 1949, indicates current assets of $979,890, compared with $906,584, the year before.

U. S. Rubber Co.

First Quarter: Net income of $3,927,-375, which is equal to $1.49 a share, compared with $3,375,069, or $1.18 a share, in the first quarter of 1949. Consolidated net sales for the first quarter of 1950 were $130,331,500, against $121,510,511 for the first quarter of the previous year.

Diamond Alkali Co.

First Quarter: Net income of $1,055,609, which is equal to 97c a share, compared with $806,008, or 75c per share in the first quarter of 1949. Sales for the first quarter of 1950 were $12,700,000, against $12,480,000 in the first quarter of 1949.

General Cable Corp.

First Quarter: Net profit of $307,961, which is equal to 6 cents each on 1,917,646 shares of common stock, compared with $785,845, or 31 cents each on an equal number of shares in the first quarter of 1949.

Sheller Manufacturing Corp.

First Quarter: Net profit of $943,463, which is equal to $1.70 each on 553,340 capital shares, compared with $853,190, or $1.52 each on an equal number of shares in the first quarter of 1949.

SPI Film and Sheeting Conference

The first Plastics Film and Sheeting Conference to be held by the plastics industry will be sponsored by the Society of the Plastics Industry, Inc. This two-day conference will take place on Thursday and Friday, May 25th and 26th, at the Commodore Hotel in New York City. Leaders of this new branch of the plastics industry, which has experienced a remarkable growth in the last four years, will learn of the latest developments in the marketing of plastic film and sheeting, up-to-date methods of manufacturing and the newest in materials. Papers will be presented on the importance of vinyl film to the retailer, plastic upholstery fabrics in the furniture field, new methods for printing on vinyl film, trends in calenders, calendering, stabilizers, plasticizers, etc.

U. S. Rubber Sales Rise 7%

Sales of the U. S. Rubber Co. in the first quarter of 1950 were approximately $130,-166,000, or 7% above the first quarter of 1949, company stockholders were told at the annual meeting in Passaic, N. J., on April 18. Officers of the company said that earnings for the period should run about the same as last year, or possibly a little ahead, although some raw material costs have been rising. Herbert E. Smith, chairman of the board, said that a special meeting of stockholders would be held in June to vote on amendments to the company's pension plan which would increase minimum disability benefits to $60 a month, and retirement allowances to $80 a month after 20 years of service, and to $100 a month after 25 years of service, with graduated benefits for service between 20 and 25 years. If approved, the amended plan will become effective July 1 and will be available to all employees.

Cites DuPont Patent Policy

In the latest development of a suit begun in 1944, the Government of the United States recently claimed that E. I. du Pont de Nemours & Co., Inc., gave away more patents than it got in an alleged world cartel conspiracy. Government attorneys said in the period from 1907 to 1948, DuPont received only 23 patents on explosives from Imperial Chemical Industries, Ltd., of Great Britain. It was added that DuPont secured 488 patents on its own during these years, but did not mention how many it had turned over to the British firm. The Government contended at a Federal anti-trust hearing that DuPont and ICI conspired behind the screen of a patent agreement to split the world market for explosives and other products. The defendants contend the patent agreement was a legitimate device for the exchange of research information and other data.

Relocates Marketing Department

Raybestos-Manhattan, Inc., has announced a new location for the Department of Marketing and Merchandising at the corporation's executive headquarters, 61 Willett St., Passaic, N. J. The Department was formerly located in New York City. The move will effect a closer working arrangement with company officials and a desirable expansion of activities under the continued supervision of Franklin A. Miller, director of marketing and merchandising, and J. W. Brush, Jr., assistant director.

Correction

The March, 1950, issue of RUBBER AGE, carried a financial report on the activities of the DeVilbiss Co., Toledo, Ohio, which was later found to be in error. The correct statement for 1949 follows: Net profit of $585,093 on net sales of $12,715,503, which is equal to $1.95 a common share, and compares with $947,967 on net sales of $15,745,922, or $3.16 a share, in 1948. DeVilbiss export shipments remained at approximately the same level as 1948, with distribution to more than 85 countries.

N. Y. RUBBER GROUP MEETING FEATURES TECHNICAL PAPERS

The presentation of two technical papers, one on foam rubber and the other on synthetic fibers, featured the Spring Meeting of the New York Rubber Group, held on April 28 at the Henry Hudson Hotel in New York City. Approximately 350 members and guests attended the meeting, with some 300 remaining for dinner. Some excellent entertainment was provided after dinner.

The meeting was officially opened by D. Earl Jones, of the American Hard Rubber Co., group chairman. Mr. Jones briefly reviewed the recent meeting of the Rubber Division, A.C.S., at Detroit (reported on in full elsewhere in this issue), making particular mention of the current membership drive. He announced that George Vacca (Bell Telephone Laboratories) was handling divisional membership for the New York Rubber Group and that Mr. Vacca was prepared to furnish full information to all interested parties.

The first of the two papers was presented by E. Charlton Crocker, of the technical and administrative staff of the General Latex & Chemical Corp., Cambridge, Mass. Mr. Crocker spoke on "The Manufacture of Foam Rubber" and reviewed present methods of manufacture, trends toward new equipment, and the growth pattern of the industry. An interesting angle of his talk was the preparation of latex foam on laboratory scale equipment by Donald F. Walker, who is in charge of foam development at the General Latex Laboratories. Mr. Walker, using a so-called package unit, frothed some latex, added curing and gelling ingredients, and passed the gelled foam around for inspection.

In the early portion of his talk, Mr. Crocker explained the technical difference between latex foam and blown sponge and outlined the numerous features of the former, including its durability, cleanliness, lightness, versatility, and comfort qualities. He then traced the manufacture of latex foam in step-by-step fashion, briefly mentioning the specific compounding, curing and gelling agents used and the equipment employed. This phase of the talk carried right through to the washing and drying operations of the end product.

The latter portion of the talk was concerned with the growth pattern of the industry. Stating that the foam industry is well-founded, Mr. Crocker added that in reality it is only in its infancy. Although he did not expect the price of foam to ever drop low enough to compete with such upholstery materials as cottons, he pointed out that it is already competitive with such products as hair-filled cushions. The cost of foam has been declining, the trend toward the use of continuous mixers being in part responsible for the decline.

In concluding the talk, Mr. Crocker mentioned that the amount of "seconds" produced by foam manufacturers is constantly decreasing due to improved manufacturing techniques. There appears to be an almost insatiable market for "seconds" at present, a large portion of which are being shredded and used for pillows, stuffing toys, etc. A considerable quantity is being bonded into rug underlays. (EDITOR'S NOTE: Mr. Crocker's paper will be published in full in an early issue of this journal.)

Paper Given on Dynel

The second paper covered "Dynel—A New Synthetic Fiber," given by Eldon Stowell of the Carbide & Chemicals Division, Union Carbide & Carbon Corp., New York, who was assisted in visual demonstrations by Jack Coulter of the same firm. As indicated by the title, the talk was devoted to a comprehensive description of Dynel, a staple fiber spun from a copolymer of acrylonitrile and vinyl chloride, the latest addition to the series of vinyl fibers developed by Carbide & Carbon.

Mr. Stowell first reviewed the progress of the synthetic fibers, pointing out that the present consumption of all such synthetics, excluding rayon, amounts to approximately 1% of the total fiber market. Rayon, he said, currently represents about 14% of that market. Next, he discussed the separate properties of Dynel including its strength and resilience. He said that Dynel has good dimensional stability and is inherently thermoplastic, is acid and alkali resistant, is completely moth- and mildewproof, will not support combustion, and is easily dyed with either acid or acetate-type colors.

Turning to rubber applications, Mr. Stowell said that Dynel fabrics can be coated with rubber or neoprene providing the vulcanization temperature does not exceed 275° F. and if the fabric is held under tension. The use of the fiber in commercial footwear is expected shortly. In this application, its excellent abrasion, rot and wear resistance and the fact that shoe uppers can be made in one piece with the subsequent elimination of a lot of sewing operations appears very promising.

The speaker added that the use of rubber-coated or rubber-impregnated Dynel fabrics for overshoes and for boot linings also appears quite encouraging because of the good abrasion resistance and excellent chemical resistance against perspiration and deterioration by calcium chloride. The warm qualities of the fiber recommend its use for stadium boots as well. Some work has also been done on military items, such as rubber-coated Dynel fabrics for radar dome housings.

Quebec Meets With SPI and SPE

The Quebec Rubber and Plastics Group held a joint meeting with the Society of Plastic Engineers and the Society of the Plastics Industry on April 20, at the Canadian Legion Hall in Montreal, Que., Canada. H. J. Loiselle, technical service engineer of the Wire & Cable Division of the Northern Electric Co., Ltd., spoke on "Plastics in the Cable Industry." He described the increased use of polyvinyl chloride resins and polyethylene. The different properties of these resins determine their application, he said. The talk was illustrated with slides showing the manufacture of plastic covered wire in the Northern Electric Plant in Montreal.

STANGOR, BEHNEY, BAKER, JUVE NAMED OFFICERS OF AKRON GROUP

Results of a letter ballot for the election of officers of the Akron Rubber Group for the 1950-51 season were announced on March 31 at a meeting of the group held at the Mayflower Hotel in Akron, Ohio. Officers elected included: *Chairman,* E. L. Stangor (DuPont); *Vice-Chairman,* Dale F. Behney (Goodyear); *Secretary,* Lawrence M. Baker (General Tire); *Treasurer;* Robert D. Juve (Mohawk).

Following dinner, the 341 members in attendance at the meeting heard the Reverend George Gregory Berzinec, associate professor of Russian at Kent State University, give an interesting talk on "The Influence of Communism on Central Europe and the World." During the war years, Father Berzinec was a chaplain in the armed forces. After the address, a moving picture entitled "The Flying Fisherman" was shown.

Door prizes at the meeting were won by H. C. Bullock (Goodrich) and R. A. Hagberg (West Virginia Pulp & Paper). It was announced that the paid membership of the group had already exceeded 860, making it one of the largest groups in the country. It was also announced that the summer outing will be held at the Firestone Country Club on June 6. Charles Wimmer (Phillips Petroleum) is chairman of the outing committee.

Quebec Rubber Group Meets

Approximately 40 members and guests attended the March 23 meeting of the Quebec Rubber and Plastics Group held at Canadian Legion Hall in Montreal, Quebec, Canada. Principal speaker of the evening was Ian S. MacDonald, performance engineer of Trans-Canada Airlines. Mr. Macdonald spoke on "Aircraft Engines and Power Plant Developments." The speaker compared jet engines with the conventional types and cited the various features of each. At the conclusion of the address, a film entitled "Mr. Barnaby Sleeps in the Sky" was shown. This film depicted the latest developments in commercial airline travel.

Washington to Hear Garvey

The May 23 meeting of the Washington Rubber Group to be held at the Cosmos Club in Washington, D. C., will be addressed by Dr. B. S. Garvey, Jr., director of the sales service laboratory of Sharples Chemicals Inc., Devon, Penna. Dr. Garvey will speak on "Science and Art in the Rubber Industry." Captain William R. Millis, Assistant Chief, Bureau of Ships Director of Research and Development of the Department of the Navy, will discuss the interests of the Bureau of Ships in rubber.

A new product bulletin covering the physical and chemical properties of four beta substituted propionitriles, of which three are new products, has been issued by the New Products Development Department of the American Cyanamid Co.

WASHINGTON HEARS WERKENTHIN ON EVALUATION OF SYNTHETIC RUBBER

The March 28 meeting of the Washington Rubber Group held at the Cosmos Club in Washington, D. C., was addressed by T. A. Werkenthin, principal materials engineer, Civilian-in-Charge of the Rubber Subsection of Research and Standards, Bureau of Ships, Department of the Navy. Mr. Werkenthin spoke on "Some Techniques for Evaluating Synthetic Rubber." His address was followed by a question-and-answer period.

Mr. Werkenthin pointed out that in general the development of testing techniques has been proportionally neglected. The honest contempt of the scientist for repetitive testing is unfortunately identified with the highly specialized and intricate processes for inventing and developing new methods for evaluating rubbers.

Before the advent of highly specialized antioxidants, accelerators, and other compounding ingredients, it was possible to control the quality of the rubber article by specifying the compositon. The enormously complicated rubber compounding technique due to the wide selection of basic polymers, accelerators, antioxidants, resins, activators, plasticizers, retarders, extenders, tackifiers, stabilizers, fillers, reinforcing agents, waxes, carbon blacks, etc., has made it necessary to supplement the generally accepted routine physical tests with highly specialized evaluation techniques involving simulated service tests. Elastomers have entered so many specialized fields and are used under such diverse conditions in applications of immense tactical significance that great pains have to be taken to insure optimum performance and maximum service life.

Transition From Natural

It was pointed out that largely as a result of these testing techniques the transition from natural rubber to the many types of synthetic rubber was made in the Bureau of Ships without sacrifice of quality of rubber materials represented by well over 100 specifications under which procurement is carried out. It was also pointed out that specialized physiological tests are often required in such items as gas masks, diver's hose, and rescue chamber hose where the lives of personnel are directly dependent upon the performance of the rubber material.

The brief discussion of all 99 test procedures involved is covered in publications in the RUBBER AGE appearing in May, June, July, August, September, October and November, 1946, and October, November and December, 1949, issues, respectively. An outline of the tests was distributed to the members of the audience. The importance of standardization and simplification of test methods in the specialized field of low temperature testing was discussed, and the cooperative efforts of the Quartermaster Corps of the Army, the A.S.T.M. Low Temperature Committee and the Bureau of Ships was pointed out as an example of the cooperative efforts between industry and Government.

Named Technical Representative

Bernhard N. Larsen

Bernhard N. Larsen, formerly in charge of tire construction at the Armstrong Tire & Rubber Co., West Haven, Conn., has been appointed development engineer and technical representative of rubber chemicals for the Naugatuck Chemical Division of the U. S. Rubber Co. Mr. Larsen is a veteran of 24 years experience in rubber compounding and tire design. He joined the Fisk Rubber Co. in 1926 in the company laboratories. He was chief chemist with the Seiberling Rubber Co. in Canada prior to his association with Armstrong Tire. In his new position with Naugatuck Chemical, he will make his headquarters at Naugatuck, Conn. He is a native of Warren, Penna., and a member of the New York and Connecticut Rubber groups and of the American Chemical Society.

Detroit Outing on June 23

The summer outing of the Detroit Rubber & Plastics Group will be held on Friday, June 23, at the Forest Lake Country Club. It will feature golf, entertainment, dinner and prizes, and the group in charge promises "something different." Ray Cuthbertson (U. S. Rubber) is chairman of the Outing Committee, assisted by Tom Halloran (Chemical Products), H. W. Neale, Ed Kvet (Baldwin Rubber), and John Dudley (Chrysler). Members and guests are invited to come at noon and to stay late.

Chicago Group Plans Outing

The Chicago Rubber Group has secured the Medinah Country Club, Chicago, Ill., for its annual summer golf outing on July 28. Dinner will be served and prizes awarded the winners of the different golfing tournaments. Members of the Golf Outing Committee include: Bill Fairclough (Enjay); John Groot (Dryden Rubber); Otto Hlavacek (U. S. Rubber); Dwight Smith (Cary); Bob Elliott (Indoil Chemical); Charles Wonder (Van Cleef); and Clarence Bierman (American Can).

NO. CALIFORNIA GROUP HEARS TAYLOR AND CLARK ON GUAYULE

Approximately fifty members and guests of the Northern California Rubber Group atended the March 30 meeting held at the Claremont Hotel, Berkeley, Calif. Principal speakers of the evening were Kenneth W. Taylor and Frederick E. Clark of the U. S. Natural Rubber Research Station at Salinas, Calif. John A. Lilligren, formerly chief chemist of the Pioneer Rubber Mills at Pittsburgh, Calif., and now actively engaged in consulting work with the same company, was presented a bronze card symbolizing the first life membership to be issued in the Northern California Rubber Group.

In his talk, Mr. Taylor stated that guayule, a source of natural rubber that has had its ups and downs in American consumption for the past 40 years, at present holds the greatest promise as a potential domestic rubber supply. The need for the development of a homegrown source of natural rubber is strategically critical so long as unsettled world conditions prevail.

Plant breeding investigations now under way were pointed out as having resulted in hybrid forms that will out yield the best strains of wild guayule. Continued research in this field was said to have great possibilities for increasing the per acre yield as well as extending the range to areas where purebred guayule will not grow.

American Agricultural Boon

In many of the areas suitable for guayule or its hybrids, a new farm crop would be a boon to American agriculture. Improved methods of processing have already demonstrated the feasibility of producing a much more uniform guayule crude rubber than has been produced on a commercial scale in the past. Further process research and development will ultimately permit the production of a very high grade guayule crude rubber at a substantial reduction in costs, according to Mr. Taylor.

Mr. Clark spoke on "The Quality of Guayule Rubber." He pointed out that commercial guayule rubber of the past has analyzed approximately 70 percent rubber hydrocarbon, 20 percent resin, and 10 percent cellulosic material. Improvement in quality is primarily a question of purification. If "lush" shrub is used instead of "conditioned" shrub, together with recent improved milling techniques, the cellulosic material is reduced to approximately 5 percent.

Mr. Clark stated that extraction with solvents such as acetone and methyl ethyl ketone offers the most promising method for reducing the resin content. A resin content of 0.5 percent has been reached in some experiments. Either the shrub or crude rubber can be deresinated. The resin contains many organic compounds and appears to be a potentially valuable by-product. Laboratory deresinated guayule rubber compares favorably with imported smoked sheet. Mr. Clark exhibited samples of improved guayule rubber and products made therefrom.

Transfer U.S. Rubber Personnel

U. S. Rubber Co., New York 20, N. Y., has transferred several sales, sales promotion and development executives from its New York headquarters to its Providence, R. I., plant. The move, effective May 1, is aimed at improving products and customer service. Executives who will make their headquarters in Providence include John W. Sproul, sales manager of general products; Fred O. Thornton, sales manager of drug sundries, waterwear and specialties; George T. McCarthy, sales manager of golf balls; James J. Galligan, sales development manager of general products; and Gerritt V. Weston, sales promotion manager of general products. The following also moved to Providence on May 1: Thomas L. Skinner, assistant manager of drug sundries, waterwear and specialties, formerly district sales manager of general products in St. Louis, Mo.; Regis W. Higgins, assistant sales manager of golf balls, who was formerly district sales manager of general products in Detroit, Mich.; Willis B. Duckham, sales assistant in drug sundries; and Richard A. Geisler, who became assistant to Mr. Weston. Joseph G. Kowalski has been promoted from the Providence plant to become assistant to John W. Sproul. Walter J. Norris has been named sales assistant in drug sundries. Mr. Kowalski and Mr. Morris were formerly with the Sales Coordination Department.

Begins Vinyl Film Production

General Tire & Rubber Co. has begun the production of vinyl film at its plant in Jeannette, Penna. As yet, no commercial name has been given General Tire's vinyl, but it is intended for use in draperies, tea aprons, rain coats, hospital sheeting, baby pants, etc. A research program initiated by the company has brought about the development of an entirely new type of film adaptable to products of a hydroscopic nature. The firm intends to enter the packaging film field as soon as production in this field can be accelerated. While the company's plans do not call for entry into the fabricating or conversion field, it will expand its facilities still further for the production of vinyl-type leathers used in upholstering materials, luggage, etc.

Collyer Named Goodrich Chairman

John L. Collyer, president of the B. F. Goodrich Co., was recently elected chairman of the board succeeding David M. Goodrich, who was named honorary chairman. Mr. Collyer, who has been president of the company since 1939, will continue as both chairman and president. Mr. Goodrich had been chairman of the company for the past 23 years. At the annual stockholders' meeting on April 18, Mr. Goodrich was re-elected a director of the company, a post to which he was first elected in 1912. He will continue to serve also as a member of the executive committee. At the meeting of the board of directors, Mr. Goodrich was cited for his "long and valiant service both to the B. F. Goodrich Co. and to American industry."

LABOR NOTES

A pension agreement said to represent a considerable increase over the plan in effect since 1917 was reached by U. S. Rubber and the U.R.W.A. on April 5. The agreement provides $100 a month for workers 65 years of age with the company for twenty-five years. The minimum eligible group consists of those age 55 who have had 20 years with the company. Some 33,000 employees in 19 plants in 11 states are covered.

Work was resumed at the plant of the Fremont Rubber Co. in Fremont, Ohio, on April 24 when employees voted 94 to 98 to end the 38-day strike. Negotiations on union demands were to be resumed. The most controversial issue to be settled is that of the union shop asked by the Federal Labor Union (AFL). Others are wage increases and over-time and holiday time benefits.

A new contract calling for a wage increase of approximately 5 cents an hour plus a revision of the progressive wage schedule which averages an 8.8 cents per hour increase has been signed between Naugatuck Chemical and the Chemical and Plastic Workers Alliance, Inc., an independent union. The agreement covers workers at the Marvinol plant in Painesville, Ohio, which is now operated by Naugatuck Chemical.

Operations at Republic Rubber in Youngstown, Ohio, were halted for a short period around April 18 when workers refused to cross a picket line established by laboratory employees at the plant. The latter complained of working conditions and a grievance in working hours. Plant workers, however, voted to go back to work.

Arrangements for A.S.T.M. Meeting

The 53rd Annual Meeting of the American Society for Testing Materials, to be held at the Chalfonte-Haddon Hall in Atlantic City, N. J., from June 26 to 30, inclusive, will feature 23 technical sessions, committee meetings, and apparatus and photographic exhibits. A number of symposiums will be held under the sponsorship of various committees. Subcommittees of Committee D-11 on Rubber Products will hold meetings on June 28, 29 and 30, with a general meeting scheduled for June 30. Of special interest to the rubber group is a paper on conducting rubber electrodes for electrical measurements, which will be given on Thursday afternoon, June 29.

Japan Releases Rubber Curbs

The Japanese Government has released rubber from price and distribution controls. Foreign exchange control agencies will continue surveillance on private imports of rubber, an announcement by occupation authorities said. At the same time, automobiles, bicycles and other vehicles were placed on the free distribution list. The occupation announcement said the resumption of free trade made the decontrol possible.

Join DuPont Service Laboratory

J. C. Carl and R. G. Keeping, both of whom were formerly associated with the Rubber Laboratory of the Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc., Deepwater Point, N. J., have been named to the technical service staff of the Akron Service Laboratory at Akron, Ohio. Mr. Carl was appointed as specialist in natural and synthetic latex compound development, while Mr. Keeping was appointed a latex chemist.

Before joining DuPont in 1949, Mr. Carl was engaged in latex research development for 11 years with the Firestone Tire and Rubber Company. He served two years as senior chemist at the Liberian Plantation. More recently, he was associated with the Anderson Rubber Company and the Caram Chemical Company. He is a chemical engineering graduate of Purdue University and has been a member of the American Chemical Society since 1938.

Mr. Keeping was associated with Wyeth, Inc., for four years before joining DuPont in 1947 to engage in laboratory development and production supervision of dyes and, later, in latex compounding research. After graduating from Michigan State Normal College, he received his master's degree in chemistry at Albion College in 1940. He has been a member of the American Chemical Society since 1947.

Plan Trail Blazers Exhibit

The Sixth National Chemical Exposition, to be held in the Coliseum, Chicago, Ill., on September 5 through 9, will feature a Chemical Trail Blazers Exhibit planned to attract the newest ideas in science and industry. The exhibit is open to any innovations that pertain to chemistry, such as inventions, research reports, syntheses, processes, products, teaching devices or techniques. Each exhibit is in the name of the individual or team responsible for the underlying research and no commercial or advertising exhibit is accepted. The exposition pays the cost of unpacking, mounting and repacking the exhibit, but the exhibitor must pay his own shipping charges. The Trail Blazers Exhibit has been a feature of the exposition since 1944. Several of the outstanding chemical developments in that period first came to light in the exhibits of previous years.

Castor Oil Solubility Chart

Baker Castor Oil Co., 120 Broadway, New York 5, N. Y., has prepared a chart which gives the solubility at room temperature of 33 castor oil products, each with 46 common commercial solvents. The selected Baker products are typical of the classes of materials manufactured. All of the castor oil products tested were found miscible in 23 (½) of the solvents evaluated. Other cases of solubility or limited solubility are tabulated in chart form. In cases of limited solubility, the immiscible range of the mixture is reported in terms of per cent castor oil product present on a weight basis. Copies may be secured from the company.

U. S. Royal Nylon Life Tube

A new automobile inner tube made with nylon cord and said to be stronger and safer than any other tube ever developed has been announced by the U. S. Rubber Co. Reinforced with two plies of nylon cord and designed for maximum protection against the hazards of sudden deflation due to punctures or blowouts, the new tube has a reserve strength almost equal to that of the tire itself. By greatly increasing the resistance to road shock and rupture, it gives practically 8-ply safety to 4-ply tires. In the event of puncture, the nylon construction built into the wall of the tube squeezes rubber around the puncturing object, thereby preventing sudden flats and permitting only a slow leakage of air. Despite its unusual strength the new tube is extremely flexible and light in weight due to the nylon cord used in its construction. U. S. Rubber officials estimate that the new tube will outwear as many as three sets of tires. Called the U. S. Royal Nylon Life-Tube, it is specifically engineered for the smaller rim diameter and larger body of the modern tire.

Glyceryl (Mono) Ricinoleate

Glyco Products Co., Inc., Brooklyn 2, N. Y., is now producing glyceryl (mono) ricinoleate by a new process which makes possible the production of an improved, lighter-colored product not dispersible in water. This new material, Glyceryl (Mono) Ricinoleate S-1153, is a very light yellow liquid, of low free fatty acid content and has a low solidification point, below —30° C. It is of interest as a plasticizer for synthetic rubbers, giving good flexibility and lubrication at low concentrations. The product is used as an emulsifying agent and stabilizer for water-in-oil emulsions. Its insolubility in hydrocarbons makes it particularly valuable for oil-resistant compounds.

Plastics Committee Conference

The Plastics Committee of the Massachusetts Institute of Technology is arranging a three-day conference on the mechanical properties of plastics from the standpoint of research and engineering applications. The conference will be held on June 19, 20 and 21, 1950, in Cambridge, Mass. Many papers of interest will be presented at the conference including one by R. H. Carey of the Bakelite Division of Union Carbide and Carbon Corp., Bound Brook, N.J., on "Evaluating Mechanical Properties of Polyethylene and Other Non-Rigid Plastics."

Hardesty Company Officers

According to an announcement from the W. C. Hardesty Co., 41 East 42nd St., New York 17, N. Y., a change in officers recently took place. A. F. Kitchel is now president, W. J. O'Connell and E. Jobbins are vice-presidents, and F. R. Cantzlaar is secretary-treasurer. Mr. Hardesty is no longer connected with the company either as a director or an officer.

Celebrates Fortieth Anniversary

K. K. Kantzer

K. K. Kantzer, Pacific Coast manager of the Associated Lines Division of the B. F. Goodrich Co., was recently tendered a testimonial dinner at the Huntington Hotel in Los Angeles, Calif., marking the completion of forty-years of service with the company. Among the special honors he received were hundreds of congratulatory letters from industry figures, a gift from his associates, and a 40-year emblem. Mr. Kantzer has been Pacific Coast manager of the Associated Lines Division since 1928. He joined the company as a tire adjuster in Akron, Ohio, on March 21, 1910. In his present position, he is responsible for the sale and merchandising of the Hood, Miller, Diamond and Brunswick tire, tube and accessory lines.

American Zinc Buys RFC Plants

American Zinc, Lead and Smelting Co., has announced that its wholly-owned subsidiary, the American Zinc Co. of Illinois, has purchased all plant facilities and leases formerly held by the Reconstruction Finance Corporation in Monsanto, Ill., and Fairmont City, Ill. The facilities were purchased for a cash consideration of $1,080,000. The facilities include installations at the Monsanto electrolytic zinc plant and zinc concentrate roasting, sulfuric acid, zinc furnace blocks and byproducts facilities at the Fairmont City plant. American Zinc plans additional expenditures of $500,000 for plant changes and improvements.

Argentinian Textile Plant

Completion of a new textile plant in Buenos Aires, Argentina, has been announced by the Firestone Tire & Rubber Co. Rayon and cotton produced in Argentina will be twisted and woven in the new plant for use in tires manufactured by Firestone in Buenos Aires. Construction of the new factory was begun during 1949. When operating at capacity, the plant will employ approximately 300 persons.

Goodrich Refueling Boom De-Icers

B. F. Goodrich Co., Akron, Ohio, has developed an unusual de-icer designed for use on the new flying boom aircraft refueling system. The new refueling method, developed by Boeing Aircraft for the U. S. Air Force, enables aircraft to refuel in flight with greater speed and at higher altitudes than previously possible. The rubber de-icers contain heating wires and are installed on the small V-shaped, wing-like control surfaces which guide the telescoping pipe when it is lowered from the tanker plane. The refueling boom is carried under the tail of the tanker plane and is inserted into a special socket in the nose of the plane being refueled. A crewman in the rear turret of the tanker plane operates the V-shaped "ruddevators" and the heated rubber de-icers provide protection for this unit if icing conditions are encountered in flight.

Two Washington Firms Merge

As part of a concentrated expansion program, the research, engineering, and marketing facilities of Kilgore Chemicals, Inc., and Atlantic Research Corp., both of Washington, D. C., have been merged. The move calls for the establishment, within the structure of the Atlantic Research Corp., of a Kilgore Chemicals Division, headed by Anthony Hass, formerly general manager of the Kilgore company. Activity of the new division will be directed toward expanded development, manufacture, and sale of specialty chemicals. Basic work of Atlantic Research will continue in the general areas of chemistry, chemical engineering, combustion, and jet propulsion for the Government as well as industry.

Goodyear Receives Freedom Award

Freedoms Foundation, Inc., Valley Forge, Penna., an organization devoted to defending and extending the "American Way of Life," has awarded a medal to the Goodyear Tire & Rubber Co. for its patriotic motion picture, "A Letter From America." The medal and $400 cash were presented to Goodyear president E. J. Thomas by Kenneth D. Wells, executive vice-president of the Freedoms organization, at recent ceremonies in Akron. Goodyear's radio program, "Greatest Story Ever Told," won first place in its category, a medal similar to one presented for the firm's motion picture and $2,000, which was awarded by General Dwight D. Eisenhower last November.

AMA Management Publications

The American Management Association, 330 West 42nd St., New York, N. Y., has published four checklists of its recent publications in the fields of personnel management and industrial relations; factory and office production; sales management, marketing and packaging, and office and financial management. Each checklist is available from the AMA on request by executives.

NEWS IN BRIEF

A 112-page illustrated history of scales has been issued by Detecto Scales, Inc., Brooklyn 5, N. Y., to commemorate the firm's 50th anniversary. Mack Rapp, vice-president of the company, is interested in securing photos and information at all times on antique scales.

Goodyear recently notified officials of the National Air Races that it will no longer continue its sponsorship of the 190 cubic inch class at the annual event in Cleveland. The company originally agreed to a three-year period of sponsorship in order to get the new class successfully launched, an objective which has been accomplished.

The Rubber and Plastics division of the John Hewson Co., New York City, has been expanded to handle all standard and special application problems. Harry Bradbury has been appointed as specialist and consultant in charge. The company specializes in static control for industry.

A new all stainless steel chemical container has been developed by the Steel Cooperage Co., Detroit 7, Mich. They are said to be strong, long lasting, easily cleaned, and easy to handle, and can be used for a wide variety of liquid chemicals.

A completely transparent book cover, said to be ideal for libraries and schools, has been introduced by the Saver Co., Washington, D. C. Made of Pliofilm, Book Savers, as they are called, are easy to put on, fitting skin tight regardless of book size.

Application of the various Res-O-Dors to plastic fabrics is covered in the No. 1, 1950, issue of the *Sindar Reporter*, house organ of the Sindar Corp., New York City. The company also has a technical bulletin available on the same subject.

A technical bulletin on Harflex plasticizers for vinyl plastics has been prepared by the Binney & Smith Co. The most commercially valuable properties of the plasticizers are listed in convenient tabular form. Ask for Bulletin No. P-1.

Eriez Manufacturing Co., Erie, Penna., producers of magnetic equipment, has appointed the O'Brien Industrial Equipment Co., San Francisco, as a sales representative.

A linear conversion table for handy reference by engineers who frequently wish to convert inches and fractions of inches into decimal parts of a foot is available from the Babcock & Wilcox Tube Co., Beaver Falls, Penna. The table is arranged on a single card and is available on request to the company.

Schutte and Koerting Co., Philadelphia 22, Penna., has issued a new 36-page bulletin describing the complete line of SK Water Jet Eductors for use in the lifting, pumping, mixing and agitating of liquids and the handling of solids and slurries at low cost.

Gra-Lite, a fabric said to be 40% lighter than the ordinary impervious fabric, has been introduced by the Standard Safety Equipment Co., Chicago 10, Ill. The new fabric is reported to provide greater resistance to a wider range of chemical hazards including, with special preparation of the base compound, resistance to anhydrous hydrogen fluoride.

The second edition of "Transformer Principles and Practice," an engineering book for industry, has been issued by the McGraw-Hill Book Co., New York City. The book deals with all aspects of the construction and use of transformers, and sells for $3.50.

Rau Fastener, Providence, R. I., makers of the nationally advertised Klikit Snap Fasteners, has announced that it will continue indefinitely the unconditional guarantee policy it instituted a year ago. The guarantee is reported to have resulted in a substantial increase in sales.

A new brochure describing the Brookfield Counter-Rotating Mixer is available from the Brookfield Engineering Laboratories, Inc., Stoughton, Mass. The mixer features time-saving efficiency, made possible by the exclusive counter-rotation principle.

Reprints of the article on "Effect of Soil Microorganisms on Rubber Insulation," which was published in the August, 1949, issue of *Industrial & Engineering Chemistry*, are now available from the Simplex Wire & Cable Co., Frederick S. Mallette, both of Fire-Cambridge, Mass.

A technical bulletin describing in full detail the method of applying polyethylene to metal surfaces using the Schori flame spray pistol is available from the Schori Process Division, Ferro-Co Corporation, Long Island City 1, N. Y. Ask for Bulletin No. 103-D.

The Office of Small Business of the Economic Cooperation Administration has issued a handbook on the principles of exporting. It is designed especially for the small businessman considering export trade under the Marshall Plan. It is entitled "Guide for the Prospective Exporter," and copies are free on request.

Ansul Chemical Co., Marinette, Wisc., has designed a periodic inspection chart to help fire inspectors keep accurate records of their extinguishers. Space for 26 inspections of up to 38 extinguishers is provided. The chart is available upon request to the company.

A fashionable raincoat made of Velon, product of the Firestone Plastics Co., is now being manufactured by the Cable Raincoat Co. of Boston, Mass.

Inflatable dress forms as an aid to home sewers are now available. Made of Vinylite, the dress forms are manufactured by Barbara Originals, Inc., New York 3, N. Y.

"Facts for Business Policy" is the title of a new booklet by Arthur D. Little, Inc., Cambridge 42, Mass., describing its services in the field of economic appraisal.

A 9-foot, 700-gallon inflatable "family lake" made of Vinylite sheeting is now in manufacture by the Bilnor Corp., Maspeth, L. I., N. Y. The pool weighs 16 pounds and is easily inflated by bicycle or automobile pump.

Black Beauty, a newly developed abrasive replacing silica sand for blast cleaning and finishing operations, has been developed by the American Wheelabrator and Equipment Corp., Mishawaka, Ind.

Listing over 590 chemical, gas and common fire hazards, the "Fire Hazard Index," published by Randolph Laboratories, Chicago 11, Ill., is now available.

As a result of increased sales and concurrently increased production, the original price of Kel-F, a fluorocarbon-type thermoplastic produced by the M. W. Kellogg Co., Jersey City, N. J., has been reduced approximately 50%.

A bulletin describing rubber-lined pipe for use in industries and mines where there are conditions of corrosion, contamination, abrasion, or flow restricting deposits has been issued by the Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J. Ask for Bulletin No. 6907.

A four-page "Market Survey of Venezuela" is being offered to interested manufacturers and exporters by Market Guide for Latin America, 170 Broadway, New York 7, N. Y.

Foster D. Snell, Inc., New York 11, N. Y., has announced their entry into the field of "spray drying" with the publication of an eight-page booklet describing "Packaged-Unit Spray Dryers."

United States exports of rubber, allied gums, and manufacturers got off to a slow start in 1950, being valued at $7,360,917 in January, a decline of 34.8% from the $11,283,431 reported in January a year ago, according to the U. S. Department of Commerce.

Amine Type Accelerator Activator

Aktone, a new amine type accelerator activator designed for use with thiazole and thiuram primary accelerators, and which is said to produce maximum increase in activity and minimum scorchiness at substantial cost savings, has been introduced by the J. M. Huber Corp., New York. More active in GR-S, the new material helps in reaching an equal state of cure in both hydrocarbons in blends of natural rubber and GR-S. In natural rubber, it is said to be very effective in gum stocks and in those with clay and furnace black loadings. Tests have indicated that for GR-S and cold rubber camelback compounds, a combination of equal parts of Aktone and MBTS provides excellent acceleration, with the combination substantially reducing the tendency to set-up in storage and to maintain curing rate after long storage periods. A technical bulletin is available on request from the company giving the physical properties of Aktone and test data.

Jenkins Company Organized

James W. Jenkins and Dan F. Retzer, formerly associated with Tanney-Costello, Inc., Akron, Ohio, have formed the J. W. Jenkins Co., Inc., with offices at 2158 Front Street, Cuyahoga Falls, Ohio, for the sale of crude rubber, reclaimed rubber and plastics. The firm will act as Akron representative for T. A. Desmond & Co., New York, N. Y., and sales agents for the materials produced by the Dasher Rubber & Chemical Co., Fairport, Ohio. Mr. Jenkins has been in the rubber trading field since 1937, and was associated with A. Schulman, Inc., prior to the war. After returning from the Army, he joined Tanney-Costello. Mr. Retzer was with the American Hard Rubber Co. in Akron prior to the war, and joined Tanney-Costello shortly after returning from Army service. Mr. Jenkins and Mr. Retzer both served in headquarters of the 36th Infantry Division in the United States and abroad.

Eriez Named RCA Agent

Eriez Manufacturing Co., of Erie, Penna., has been named distributor for the Electronic Metal Detectors produced by the Industrial Equipment Division of the Radio Corporation of America. Eriez will handle all sales in the United States and Canada. The RCA detector will discover any metal that becomes embodied in materials being processed. It warns of the foreign body by bell, light, etc., and it also can be set up to halt conveyor lines.

Hardesty Names Chicago Agent

W. C. Hardesty Co., Inc., 41 East 42nd St., New York 17, N. Y., manufacturers of fatty acid products, have announced the appointment of William E. Phillips, Inc., as their Chicago, Ill., representative, effective April 1, 1950. W. C. Hardesty Co. will continue to carry warehouse stocks in Chicago from which immediate deliveries can be made.

Develops Revolving Rubber Heel

A new and unique rubber heel featuring a revolving insert has been developed by Henry Shepherd, 735 Lime Avenue, Long Beach 13, Calif. The size of an ordinary rubber heel, this one employs a revolvable rubber disc that fits into the back part of

the heel. The disc pivots on a hard rubber peg, rotating as the wearer walks. The insert is secured to the body of the heel by the hard rubber peg. Once the disc has been placed into position a vacuum is formed which holds the insert securely but allows it to revolve. Certain models of the heels provide a locating button with which the insert can be secured in a number of positions. The heel is affixed to the shoe in the usual way. When the heel has been fastened to the shoe, the revolving disc is inserted by moistening the peg and slipping it into the groove provided in the body of the heel. This operation may be performed in five seconds. The unique design of the heel prevents one portion of it from becoming "run down." The heel is also said to provide an unusual degree of comfort to the wearer. Mr. Shepherd is presently marketing his patented heel under the name of the "Scotch Heel." He is, however, interested in securing additional capital for the manufacture and sale of his product. He is also interested in the manufacture of the heel by other concerns on a royalty basis.

Florida Test Service Expands

South Florida Test Service of Miami, Fla., has acquired an additional city block for the expansion of their inland proving grounds. Plans call for a new $25,000 laboratory building with construction to start early this summer. The firm maintains a complete weather station at its inland proving grounds as well as complete solar radiation recording instrumentation. The company now maintains three locations in South Florida in addition to the main inland test field and laboratory in Miami. The locations at Miami Beach are for salt atmospheric tests and marine tests such as tidewater and total immersion in the ocean. A warehouse is also maintained in Miami for storage tests on packaging of foods, metal parts, etc.

Reports on Uniform Rubber

In June, 1946, a Committee for Uniform Rubber was organized in Indonesia. Reports of this committee were presented at meetings of the Rubberbond at Batavia in August and the Rubber Research Institute at Kuala Lumpur in September. These reports are published in full—in English—in the December, 1949, issue of *Archief voor de Rubbercultuur*. Subjects covered include the following: Steps towards uniform natural rubber, manufacture of clean and uniform rubber on estates, better rubber at short notice, homogeneous rubber and new delivery forms through centralization, some directives and views on the centralized preparation of rubber. The issue also contains a major contribution to the technical literature in the form of an extensive article on Hevea latex as a biological substance. Copies of the issue can be secured from De Administratie der A.L.S.-Periodieken, Factorij - gebouw, Batavia, Java.

Additional Dutch Reports

The Rubber-Stichting (Rubber Foundation) of Delft, Holland, has issued four new communications in recent months. Three of these (Nos. 53, 54 and 55) are in a single booklet, while the fourth (No. 56) is a booklet in itself. Titles of these new reports are as follows: Preparation and Properties of Rubberlike High Polymers. I. Polymerization of Dienes and Vinyl Compounds in Bulk (Comm. No. 53); II. Polymerization of Mixtures in Bulk (Comm. No. 54); III. Polymerization of Mixtures in Emulsion (Comm. No. 55); Permeability of Different Rubbers to Gases and Its Relation to Diffusivity and Solubility (Comm. No. 56). Communications Nos. 53, 54 and 55 were prepared by C. Koningsberger and G. Salomon, and Communication No. 56 by G. J. van Amerongen. Copies of these reports are available on request from the Rubber-Stichting.

DuPont Plans New Orlon Unit

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has announced plans for the construction of a new unit at Camden, S. C., for the production of its Orlon acrylic fiber in "staple form." Textile circles state that the plant now nearing completion will make about 6,000,000 pounds annually and will cost about $20,000,000. It has also been stated that DuPont has asked for engineering construction bids for an additional 40,000,000 pounds of capacity which may cost $100,000,000.

Paisley Dilution Calculator

In order to assist all adhesive users in figuring the proper amount of water to be added to a given amount of adhesive to any desired percentage, Paisley Products, Inc., 1770 Canalport Avenue, Chicago, Ill., has prepared a calculating chart which quickly indicates the desired information. Copies of the chart may be secured by writing the company.

LOS ANGELES NEWS

Approximately 250 members and guests of the Los Angeles Rubber Group attended the April 4 meeting held at the Hotel Mayfair, Los Angeles, Calif. The meeting was sponsored by the Goodyear Tire & Rubber Co. Frank Steele, plant manager of Goodyear's Los Angeles Plant, acted as master of ceremonies for the meeting. The technical group heard Ross E. Morris, rubber technologist of the Mare Island Naval Shipyard, San Francisco, Calif., speak on "The Behavior of Rubber Gaskets at Low Temperatures."

In his address, Mr. Morris said that a gasket made from either natural or synthetic rubber may fail at low temperatures because of one or more of the following changes in the rubber: Increase in internal viscosity; crystallization and second order transition.

Increase in viscosity of the rubber does not affect the recovery stress of the gasket, which is responsible for its ability to seal fluid pressure, unless the bearing surfaces containing the gasket are not sufficiently rigid and move too far apart when fluid pressure is applied. In that event, a gasket with high internal viscosity will not recover fast enough to maintain adequate sealing pressure against the bearing surfaces and leakage will occur.

Crystallization of the rubber in the compressed gasket causes the recovery stress to relax and may result in complete loss of sealing ability. The effect of crystallization is worsened by the shrinkage in volume of the gasket which is a concurrent effect. If a compressed gasket is cooled below the second order transition temperature of the rubber, complete stress relaxation occurs and the gasket leaks.

Ordinary GR-S containing a good low temperature plasticizer is one of the best rubbers to use in gaskets for service at low temperatures since this rubber does not crystallize and the plasticized rubber has low internal viscosity. The cold compression set test is an excellent method of evaluating vulcanizates for gasket service at low temperatures, Mr. Morris concluded.

Brigadier General Thomas H. Chapman, USAF, addressed the group on "Air Force Procurement on the West Coast." It was announced that the group will hold its annual summer outing on June 17 and 18 at the Del Mar Hotel, Del Mar, Calif. The golf tournament will be held at the Rancho Santa Fe Golf Club. Tennis, badminton, shuffleboard, swimming, fishing and other games of entertainment and chance have been planned.

Kirkhill Rubber Co. has embarked on a long range plan to move all the company facilities to a 13-acre site in Brea, Calif. An additional unit comprising 47,000 square feet is now being started, adding to the 13,000 square feet presently in operation.

The DeVilbiss Company will open a new assembling, warehousing and distributing plant in Santa Clara, Calif., about June 1, according to an announcement made by Howard P. DeVilbiss, president. The company, with main office and plant in Toledo, Ohio, manufactures complete spray painting equipment, air compressors, hose, spray paint booths, atomizers and related items.

Opening of the West Coast plant, Mr. DeVilbiss said, will better enable the company to meet price and delivery competition by permitting carload shipment of parts for assembly in Santa Clara, with consequent reduction in freight charges. The new plant will serve the territory covered by DeVilbiss sales branches in San Francisco, Los Angeles and Salt Lake City.

The April meeting of the board of directors of the Los Angeles Rubber group was held in the home of Mr. and Mrs. Carl Hoglund in San Gabriel, Calif.

Dr. R. P. Dinsmore, vice-president in charge of research and development for the Goodyear Tire & Rubber Co., was scheduled to address the May 2 meeting of the Los Angeles Rubber Group. Dr. Dinsmore's paper was entitled "Rubber Prospects." A full report on the meeting will appear in the June issue of RUBBER AGE.

Inspection Bureau Progressing

Considerable progress in the field is reported by the Crude Rubber Inspection Bureau, Inc., which maintains headquarters at 51 East 42nd St., New York 17, N. Y. This organization inspects and appraises the grade, quality and condition of all lots of crude rubber received through the Port of New York and assures the customer of crude rubber deliveries equal to RMA specifications. A special circular has been prepared by the company outlining its inspection, grading and sampling services, as well as its fees. Copies of the circular are available from the company on request.

Named Technical Representative

J. A. Herring, for the past nine years associated with the development, production and sales of plastic materials produced by the Naugatuck Chemical Division of the U. S. Rubber Co., New York 20, N. Y., has been named technical sales representative for Marvinol resins in the New York area. Mr. Herring will make his headquarters at Naugatuck's New York office at 254 Fourth Avenue.

Form Morton-Withers Chemical Co.

Morton-Withers Chemical Co. has been formed in Greensboro, N. C., as successors to the Morton Chemical Co. The change has been occasioned by the addition to the organization of John P. Withers as vice-president and secretary. Coincident with the change in name, the company has increased its capital stock and working capital to add $100,000 to its resources. Mr. Withers was previously associated with the Esso and Standard Oil Companies. During the war years he was loaned to the Government by Standard Oil and served with the Petroleum Administration for War as a coordinator on the Aviation Gasoline and Synthetic Rubber Chemicals Program. He returned to Standard Oil after the war in the management coordination end of the Chemical Products Division. In his new association, Mr. Withers will give especial attention to production and research. Joseph R. Morton, founder of the company, will continue as president and treasurer and will devote his efforts to general management and sales promotion.

NBS Testing Procedures Outlined

The National Bureau of Standards receives many inquiries from industry and other sources regarding the scope of its testing program, the type of tests it makes, and the fees it charges for this service. A new circular, "Testing by the National Bureau of Standards," has just been published which fully describes the Bureau's test policy, presents general information on testing, and lists fees for most of the test work that is done. National Bureau of Standards Circular C483, 93 pages, is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 25 cents a copy. Remittances from foreign countries should be in United States exchange and should include an additional sum of one-third the publication price to cover the cost of mailing.

Drakeley Retires as Editor

T. J. Drakeley, who has edited the *Transactions of the Institution of the Rubber Industry* since the inauguration of that journal in June, 1925, has relinquished that position. He has also edited all of the annuals issued under the title of "Annual Report on the Progress of Rubber Technology" to date. Dr. Drakeley will devote more time to the development of the National College of Rubber Technology, of which he is director. Future issues of the *Transactions* will be edited by G. E. Holmes-Siedle, registrar of the I.R.I.

Werner G. Smith Resigns Posts

Werner G. Smith, president of the Werner G. Smith Co., Cleveland 2, Ohio, and executive vice-president of the Archer-Daniels-Midland Co., has announced his resignation from both companies as of May 1. Archer-Daniels-Midland will continue all the regular operations of Werner G. Smith Co. as a division of the parent company.

NEW RUBBER GOODS

Tech-A-Mist Hygienic Instrument

Tech-N-Kal, 12925 Auburn Road, Detroit 23, Mich., has developed a new feminine hygiene syringe named the Tech-A-Mist. Made of non-toxic gray rubber and pastel shades of plastic, the device at-

taches to the bathroom mixer faucets giving an abundance of clean warm water. By means of a pressure relief valve the outflow water at the nozzle end is held at a minimum of one-quarter pound to a maximum of one pound, or the equivalent of a conventional instrument hung at shoulder height. The Tech-A-Mist is used in conjunction with a new medicant for feminine hygiene, Tam-Tabs, also developed by the company.

Lotta Lather Bath Novelty

Nu Novelty Co., 317 West 45th St., New York 19, N. Y., has introduced the Lotta Lather Back Washer which combines soft sponge rubber on one side and hundreds of tiny bristles on the other to form a reversible pad. Extending from each end

of the pad are non-rusting chrome chains with plastic rings. In operation, the pad is slipped behind the bather's back. By controlling the chains with his hands, he can draw the Lotta Lather across his back insuring a satisfactory back wash. The novelty may also be used in place of a washcloth, or as an aid to shampooing the hair. It comes in three colors—rose, green and blue.

Cat's Eye Reflecting Roadstud

Reflecting Roadstuds, Ltd., Halifax, Yorkshire, England, are introducing the "Cat's Eye" Reflecting Roadstud into United States and Canadian markets. Used for the past 12 years on roads in England and on the Continent, the roadstuds have proved a boon to drivers traveling at night. The Cat's Eye roadstud consists of two

highly efficient reflecting lenses housed in a resilient rubber pad. The pad clips into a cast-iron base fitted with ramps to protect the pad. The metal bases are sunk into the road surface along the centerline of the road, and at intervals varying from 8 to 15 yards. When the reflector lenses are picked up by a car's headlights, the effect is of a series of brilliant small lights marking the line of the road ahead.

Gold Seal Rubber Duckling

Gold Seal Specialties, Inc., 116 King St., Brooklyn 31, N. Y., have announced production of the Gold Seal Sponge Rubber Duckling, a novelty bath sponge. Made of extra-soft natural rubber sponge that

is completely grit-free, the product can be used on the tenderest skin. Approximately 2½ by 3½-inches in size, the duckling's body is formed by edge-sealing, on three sides a colorfast blue, red, or green top to a natural color bottom, forming a hollow into which soap may be inserted. A die-cut head is fused on making a floating bath toy that lathers freely.

Dow Corning Corp., Midland, Mich., has made available an attractive metal wall dispenser which holds a normal month's supply of 3 x 7-inch Sight Saver tissues. The dispenser and refill packets are currently available.

Inflatable Vinylite Lounge Chair

An inflatable lounge chair made of Vinylite plastic and weighing only slightly more than two pounds is being produced by Plastictronics, Inc., 54 Greene St., New York, N. Y. Designed for sun bath-

ing, the beach, picnics, camping, etc., the chair has no rigid parts and the flexible back rest adjusts itself to any posture sitting up or lying down. A built-in compartment in the back rest affords a convenient storage place for cigarettes, cards, tissues, books, etc. When inflated and ready for use, the seat cushion measures 18x19 inches and the back rest 16x19 inches. The chairs are easily inflated by mouth or pump.

Koroseal Greenhouse Sheeting

Greenhouse sterilization sheeting made of Koroseal has been developed by the B. F. Goodrich Co. The sheeting is used as a covering for plant beds while they are subjected to the steam which sterilizes the soil. One of the major advantages shown by the Koroseal sterilization sheeting is that it provides an easy means of spotting "cold" areas in the steaming operation. The sheeting above those areas remains dull, while in those where the steam is penetrating the soil the sheeting turns shiny. Koroseal sheeting for this purpose is said to have many advantages over paper normally used for this purpose, most important of which is the fact that it can be re-used.

Vinylite Roller Coaster Novelty

New fun at the sea shore and in swimming pools for the coming summer is made possible by a huge, 6-foot inflatable Vinylite plastic wheel manufactured by the Bilnor Corp., Maspeth, L. I., N. Y. Made

in the form of a double ring with eight circular openings in between, the water wheel can be used as a float for diving and sun bathing. Named the Bil-Buoy, the novelty can be quickly inflated or deflated and weighs about 8 pounds.

Plan World Transportation Fair

Every type of vehicle from bicycles to jet planes will be shown together with spectacular pageantry covering the history of transportation at the World Transportation Fair to be held from May 30 to September 9, 1951, in Los Angeles, California. Santa Anita Park has been leased for the 104-day fair, and this site will be converted into an exposition city covering an area approximating 191 city blocks. The part which rubber has played and is playing in the development of modern high-speed transportation will be the subject of a number of exhibits. A spectacle entitled the "Cavalcade of Transportation" will be presented on what is said to be the world's largest outdoor stage. The stage will have facilities for launching rocket planes and capable of accommodating trains, automobiles, busses, boats and other forms of transportation travelling at high rates of speed. Information about the fair may be secured from World Transportation Fair, 1516 Cross Roads of the World, Hollywood 28, Calif.

Vinylite Coated Power Cord

Extruded from Vinylite plastic electrical insulating compound, a new refrigeration power supply cord made by the Hatfield Wire & Cable Co. of Hillside, N. J., is said to be easier and less costly to make. Requiring no fillers and no braid, the new refrigeration power supply cord is heavier than the conventional Vinylite plastic insulated lamp cord, but simpler and less costly in construction than the standard SJT type refrigeration supply cord. The new cord consists of two No. 18 or 16 Agw stranded conductors laid in parallel and covered with the special plastic insulating compound. This provides an integral insulation and jacket with nominal thickness of 4/64-inch and nominal separation between conductors of 7/64-inch. In tests, the new cord withstood five times the slow-compression weight without short circuiting.

New Goodrich Research Laboratory

Construction of an applied research laboratory, third unit in the B. F. Goodrich Chemical Co. installation at Avon Lake, Ohio, was scheduled to begin in May. A general chemicals plant and experimental station are already in operation. The new Avon Lake unit will provide modern facilities and tools for applied research. The one-story building will cover 17,500 square feet and will have separate materials and processing laboratories, a compounding room, Banbury mixing room, controlled temperature test room, offices and conference rooms.

H. A. Astlett Relocates Office

H. A. Astlett & Co. has moved its New York City offices from 27 William St., New York 5, to 39 Broadway, New York 6, N. Y. The telephone numbers, WHitehall 4-3210-5, remain the same.

CANADIAN NEWS

J. M. Robbins, associated with the B. F. Goodrich Co. since 1928, has been elected vice-president in charge of manufacturing of the B. F. Goodrich Rubber Co. of Canada, Ltd., Kitchener, Ont., Canada. Mr. Robbins had served the company in California, Sweden and Colombia before going

J. M. Robbins

who has been elected vice-president in charge of manufacturing for Canadian Goodrich.

to Canada in 1949 as general manager of manufacturing there. In his new position, Mr. Robbins succeeds B. M. Costello who became vice-president in charge of manufacturing for International B. F. Goodrich, a division of the parent concern.

Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., has reported a net profit of $1,523,965 for 1949, which is equal to $4.71 each on 257,260 common shares. In the preceding year, net profit was $2,412,119, or $8.14 each on an equal number of shares. During the year expenditures totaling $1,741,755 were made for additions to plant and equipment and to improve plant capacity.

First shipments from Canadian Industries, Ltd.'s, new polyethylene plant at Shawinigan Falls, Quebec, have started. The initial output of the plant has been limited to polyethylene tubing. Machinery for extrusion of film has been installed, and equipment for polyethylene sheeting manufacture was to have been in operation by May 1. Until this year, all polyethylene film used in Canada had been imported from the United States.

W. A. Geddye has been appointed in charge of sales and service to the rubber industry by Monsanto (Canada) Ltd., Montreal, Toronto and Vancouver. Mr. Geddye was formerly associated with the Miner Rubber Co., Ltd., Granby, Que.

Aerial Advertising Innovation

An innovation in aerial advertising is the Kytoon kite balloon featuring a neoprene bladder having excellent resistance to sunlight and gas diffusion. Manufactured by the Dewey & Almy Chemical Co., of Cambridge, Mass., the Kytoon was developed during the war as part of a crash kit for fliers downed at sea. The Kytoon looks like a midget captive blimp. It is raised and lowered from the ground by means of a 250-foot nylon line. Helium gives it initial buoyancy, and its vertical fins keep it stable and flying into the wind. The horizontal tail fins provide extra lifting power, as the Kytoon, like a kite, "climbs the wind." Tear-shaped bladders of the Kytoon are eight feet long, three and one-half feet in diameter, and the encased in nylon fabric. Bladder and casing together weigh only a little more than a pound and a half. In peacetime, the Kytoon lends itself to aerial advertising, and also to suspend radio and television aerials, equipment such as weather apparatus, etc.

Rempel Mexican Company Formed

Rempel Manufacturing, Inc., Akron 11, Ohio, has completed negotiations for the formation of a new Mexican company, Rempel, S.A. de C.V., near Mexico City. The new firm, organized with Akron and Mexican capital, has been licensed to use the Rempel-developed "rotocast" process in the manufacture of rubber toys. The new firm is headed by William Z. Northrup, formerly associated with the Goodyear Tire & Rubber Co. Mr. Northrup will serve as president, treasurer and a director. D. G. Rempel, president and general manager of Rempel Manufacturing, will serve as vice-president. Jess Dalton is secretary of the Mexican firm. The Akron firm will serve as production and technical consultant and furnish "know how." The first machinery used by Rempel Manufacturing will be shipped to the Meixcan firm in the near future.

General Tire Elects Officers

At the 34th annual meeting of the board of directors of the General Tire & Rubber Co., held recently in Akron, Ohio, all officers were re-elected. At a stockholders' meeting which preceded the board meeting, four new directors were elected. The new directors are E. W. Ross, Detroit, Mich.; John Creamer, New York, N. Y.; B. E. Smith, New York, N. Y.; and M. G. O'Neil, Akron. All other directors of the company were re-elected. M. G. O'Neil, son of W. O'Neil, is the board's youngest member at 28. Since returning from military service, Mr. O'Neil has been connected with General Tire's treasurer's office and foreign plant operations.

Tennant Moves New York Office

C. Tennant, Sons & Co., have moved their New York offices from the Empire State Building to 100 Park Avenue, New York 17, N. Y. The telephone number is ORegon 9-1300.

Invents New Rayon Spinning Unit

Harry A. Kuljian, head of the Kuljian Corp., 1200 North Broad St., Philadelphia 21, Penna., has announced the development of a new rayon spinning and processing machine which may revolutionize the half-billion-dollar rayon yarn industry. The most startling feature of the Kuljian machine is the fact that a process which now takes from 4 to 5 days by the customary "pot-spinning" method, from the viscose solution to the finished yarn on the bobbin, is actually completed in 3½ minutes. It employs a new principle for manufacturing continuous filament synthetic yarn for apparel fabrics, tire and other industrial uses. The Kuljian method is said to produce a superior quality yarn with greater production per spindle at less cost. In addition, less production space is required, calling for a smaller capital investment and reduced production cost.

DuPont Forms New Divisions

E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del., has announced the formation of new production and sales divisions of the Polychemicals Department. The divisions were formed by the integration of plastics sales with those of chemical sales. C. H. Doherty, Jr., is director of the new Production Division and E. F. Schumacher heads the new Sales Division.

U. S. Rubber Pinch Valve

A new rubber pinch valve for use in the mining, paper, chemical, oil, food and beverage industries has been developed by the Mechanical Goods Division of the U. S. Rubber Co., New York 20, N. Y. The new valve will outwear metal when installed in pipelines carrying abrasive or corrosive mixtures, the company states. Its flexibility will offset misalignment in pipes, and no packing or repacking is required. Its metal parts can be refitted to new valve bodies thereby reducing placement costs. Valves are available in abrasive and corrosive resistant compounds, neoprene for oil resistance, butyl rubber for high heat and severe acid conditions, and pure gum stock for food and beverage conveyance. Design of the valve is compact, with mechanism, retaining rings and pinch valve body in one unit, an advantage for installations where space is limited.

Goodyear Neolite Innersoles

The Shoe Products Division of the Goodyear Tire & Rubber Co., Akron, Ohio, has developed an innersole made of Neolite. The new innersole is said to be sanitary, flexible and helps shoes retain original shape. Also, the innersole will not crack, curl or squeak. The new product, which has been tested under all conditions of wear in all kinds of weather, is finished with a suede surface which permits the foot to slide easily in and out of the shoe and get proper ventilation.

OTS German Patent Guide

A new "finding" guide to wartime German patent applications has been issued by the Office of Technical Services of the U. S. Department of Commerce. The guide is a subject index to the 200,000 German applications filed in the Berlin Patent Office over the period 1940 to 1945, and breaks them down into 13 major industrial groups, 89 classes and some 500 subclasses. The Association for the Diffusion of Documentation, Paris, France, compiled the finding guide, which OTS has translated for American use. The association is offering, at $3.00 each, microfilm copies of complete patent applications. This fee not only covers the preparation of the reproduction, but the task of locating the application from some one thousand microfilm reels on which the German applications were copied. Copies of the German patent application finding guide, entitled "Subject Outline of the Unpublished Applications for Patents filed at the German Patent Office—1940 to 1945," are available on request from the Office of Technical Services, U. S. Department of Commerce, Washington, D. C.

Arrow Rubber Corp. Moves

Arrow Rubber Corp., formerly of Bogota, N. J., has changed its name to the Arrow Rubber & Plastic Corp., and moved to new and larger quarters at 493 Boulevard, East Paterson, N. J. The new phone number is Fairlawn 6-5300.

For Sale: COMPLETE FOOTWEAR PLANT

Machinery still on foundation—Equipment operated less than 1 year—Bought new—Excellent condition—Priced very reasonably—Can be purchased complete or in individual pieces.

EQUIPMENT INCLUDES:

20" x 22" x 60" Mill and 20" x 24" x 36" Cracker—both on one drive, force feed lubrication, 200 hp motor through Philadelphia gear enclosed herringbone reducer.

20" x 60" 3-roll Calender with even and friction speed gears—all gears including bull gear and pinion are herringbone—G. E. 125 hp motor, powered roll adjustments, force feed lubrication, enclosed herringbone reducer.

2-12" x 30" 4-roll Calenders—each with 60 hp motor and herringbone reducer—Gears all herringbone.

8' 6" x 42' long Horizontal Vulcanizer with quick opening door—track, gauges, 40 cars.

61" wide x 24' long Spreader, rubber.

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OBITUARIES

Clyde S. Stilwell

Clyde Scott Stilwell, assistant to the president of the New Jersey Zinc Co., and former vice-president of the National Biscuit Co., died on April 19 at St. Luke's Hospital in New York City. He was 63 years old. Born in Bridgeport, Ohio, Mr. Stilwell was graduated in 1909 from Berea College and in 1913 from Kent College of Law, Chicago, Ill. During the first World War, Mr. Stilwell was engaged in diplomatic service. After a period of general law practice, during which he administered the estate of the late Cyrus H. McCormick, Mr. Stilwell joined National Biscuit. In his career with that company from 1929 to 1945 he rose to vice-president of the company. He joined New Jersey Zinc after leaving National Biscuit. Mr. Stilwell was a member of the University Club, a trustee of the New York Savings Bank, and a director of the National Better Business Bureau. His wife, two daughters and a son survive.

William S. Westervelt

William S. Westervelt, vice-president, credit manager and a director of Deering, Milliken & Co., New York, N. Y., died on April 20 at Columbia-Presbyterian Medical Center in New York City after an illness of four weeks. He was 62 years old. Born in Paterson, N. J., Mr. Westervelt was a member of the Ivanhoe Masonic Lodge, the Holland Society of New York, the New York Credit Men's Association and the Downtown Textile Credit Group. He was also a member of the Textile Square, Arkwright and Merchants Clubs. He is survived by his wife and son.

Roland B. Respess

Roland B. Respess, inventor, engineer and founder of Respro, Inc., Cranston, R. I., died at his home in Wickford, R. I., on April 27. He was 77 years old. Mr. Respess founded Respro in 1912 and remained active as head of its Experimental Department until he became ill two years ago. About twenty years ago, Mr. Respess attracted nation-wide attention when he waged an unsuccessful fight to gain Federal support for the manufacture of a new type dirigible, which he had designed.

Louis A. Delagrange

Louis A. Delagrange, former production superintendent of the Kelly Springfield Tire Co., died in Cumberland, Md., on March 28. The body was brought to Akron for funeral services on April 1. Burial was in North Springfield Cemetery, Ellet, Ohio.

Crosby Richards

Crosby Richards, sales director of the South African organization of the Goodyear Tire & Rubber Export Co., died on March 26, at Port Elizabeth, South Africa, as the result of a heart attack. He was 55 years old. Born in Dickinson, N. D., in 1895, Mr. Richards was graduated from the University of North Dakota and attended the University of Pennsylvania for post-graduate work. He joined Goodyear in April, 1925, and left the United States for his first foreign assignment in Italy two years later. He was appointed manager of the company's sales organization in the Philippine Islands in 1930 and manager of the Brazil sales operations seven years later. Mr. Richards was named as sales director of the Australian company in 1938. He was appointed to the post he held at his death in 1949. His wife and two sons survive.

Charles H. Kravitz

Charles H. Kravitz, vice-president of Anchor Rubber Products, Inc. Cleveland 12, Ohio, for the past 18 years, died on April 4 in Mt. Sinai Hospital in Cleveland. He was 76 years old. Mr. Kravitz, a native of Lithuania, had made his home in the Greater Cleveland area for the past 35 years. He was active in Jewish charitable and welfare associations. He is survived by four sons, two of whom, Oscar and Benjamin Kravitz, are officials of Anchor Rubber Products. Services were held in Cleveland on April 6.

William J. Canary

William J. Canary, Eastern Division sales manager of the Barr Rubber Products Co., Sandusky, Ohio, died on April 11 at his home in Great Neck, L. I., N. Y. He was 56 years old. During World War II, Mr. Canary was associated with the Chemical Division of the War Production Board. He was a member of the Advertising Club, Royal Arcanum and the Toy Knights of America. His wife and two sons survive.

Hookon R. Norgaard

Hookon R. Norgaard, associated with the Goodyear Footwear Corp., Providence, R. I., died at his home in Cranston, R. I., on April 16. He was 56 years old. Mr. Norgaard was recognized as an eminent yachtsman.

The Sole and Heel Division of the U.S. Rubber Co. has opened an office in the company's Boston branch at 560 Atlantic Avenue. E. W. Colman has been placed in charge of the new branch.

U. S. Rubber Renews Fellowships

Graduate fellowships in chemistry established at ten leading universities by the U. S. Rubber Co. have been renewed for the academic year 1950-51. The universities which have accepted the fellowships are: California Institute of Technology, Pasadena, California; Cornell University, Ithaca, New York; Harvard University, Cambridge, Massachusetts; Massachusetts Institute of Technology, Cambridge, Massachusetts; Northwestern University, Evanston, Illinois; University of California, Berkeley, California; University of California at Los Angeles, California; University of Chicago, Chicago, Illinois; University of Minnesota, Minneapolis, Minnesota; University of Wisconsin, Madison, Wisconsin. The fellowships will be available for the academic year starting July 1. Under the terms suggested by the rubber company the fellow will receive $1,200 per year if single, or $1,800 per year if married. The university will receive $1,000 to cover tuition and other costs. At the same time, it was announced that a fellowship in physics at the University of Virginia had also been renewed for the coming academic year. This fellowship carries a stipend of $1,500.

Rubber Exports Decline 38.5%

United States exports of rubber manufactures and synthetic rubber were valued at $13,592,350 during the first two months of 1950, a decrease of 38.5 percent compared with $22,095,200 during the corresponding period of 1949, the U. S. Department of Commerce reported recently. Synthetic rubber accounted for $953,116 of the total value of shipments for the two months of 1950, an increase of 35 percent compared with $707,986 for the corresponding period of 1949. Exports of every other major category of rubber manufactures declined. Exports of rubber, allied gums, and manufactures were valued at $6,231,433 in February, the lowest figure since October 1945. The January value was $7,360,917 and that for February a year ago $10,811,769. Exports of transportation goods (tires, tubes, camelback, and tire repair materials) accounted for 58.3 percent of the January-February, 1950, total value as against 64.2 percent in the like period of 1949.

Slush Molding Vinyl Plastisols

Watson-Standard Co., 225 Galveston Ave., Pittsburgh 19, Penna., has developed a complete series of plastisols for slush molding. These plastisols are available in a wide range of properties. They may be obtained in all colors from a free-flowing plastisol to a very heavy paste-like material. They are available at 100% solids containing no solvents, which means no loss on using. The final product using these vinyl plastisols is said to possess many desirable characteristics. Such properties as viscosity stability, no settling, color stability at elevated temperatures, mold release, tear strength, etc., are outstanding in these compounds, the company maintains.

THE STORY BEHIND THE WORD...

DUNCE...

Oddly enough the word "dunce" comes from the name of one of the most famous philosophers of the middle ages—Duns Scotus. His philosophy was so hard to follow and so little understood that it was in many cases derided as nonsense. Thus the name of his followers, the Dunsmen, was used to describe people who talk foolishness. From this word comes our term "dunce", a stupid person.

A long record of strength, stability and progressive leadership has made the word Muehlstein—the First Name in Scrap Rubber.

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"PIO-CON"

THE FIRST LOW PRICED

MOLD LUBRICANT WITH ORGANO-SILICONE BASE

An emulsion that glazes hot surfaces to give easy release from curing molds, and a high gloss finish on slabs.

- ★ Instant, smooth release
- ★ Dry, non-tacky finish
- ★ Non-staining
- ★ Non-blocking
- ★ Scorch and heat resisting

One gallon of PIO-CON will make up to 50 gallons and more of stock solution.

KEEP MOLDS CLEAN WITH PIO-CON!

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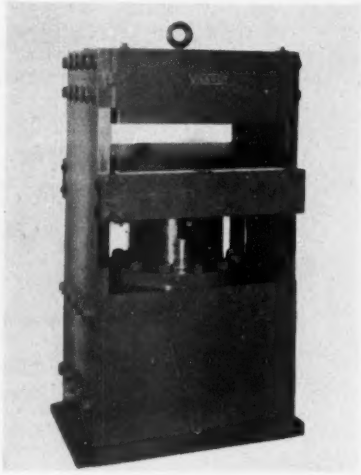
NEW EQUIPMENT

Viceroy General Purpose Presses

In a step towards standardization of hydraulic press equipment the Viceroy Manufacturing Co., Ltd., West Toronto, Ontario, Canada, has developed a standardized and uniform line of small and medium size general purpose hydraulic presses for molding, forming, drawing, laminating, etc. Advantages claimed for this standardization plan include improved and uniform methods



of production, greater accuracy and interchangeability through use of jigs and fixtures, complete adaptability for auxiliary equipment, better appearance, and lower costs of production. The company is specializing on plate side construction, but can also supply presses of the strain rod type.

Among the features stressed by the company for its plate side presses are the following: Heavy, adjustable, bronze-lined, flat guide shoes register accurately against eight flat surfaces, assuring accurate mold register and giving a large contact area to resist wear and distribute pressure; ample retaining keys are provided and in addition all retaining studs are shoulder type and are fitted in reamed holes in the side plates; cross-heads, side members, cylinders and rams are either solid steel or high tensile meehanite; all presses are designed with a safety factor of 6; gasket replacement is practically the only maintenance involved.

Viceroy general purpose presses are available with platens ranging from 10 x 10 inches to 30 x 30 inches, in unheated, steam-heated and electrically-heated types. Maximum daylight varies from 5 to 24 inches, and maximum stroke from 6 to 24 inches. Ram diameters run from 6 to 18 inches. The model illustrated herewith is Stock No. 1-700 which features 24 x 24-inch platens, a ram diameter of 14 inches, daylight of 12 inches, and a stroke of 12 inches. The company is in a position to furnish all necessary auxiliary equipment.

RUBBER & PLASTICS MACHINERY BULLETIN

Reporting News and Machine Design Developments

IN BUSINESS TO **NRM** REDUCE YOUR COSTS

Many Variables Affect Special Extruder Applications

There is no "standard extruder" suitable for maximum efficiency in every application

There are many factors which must be taken into consideration when determining special extruder applications. Some of these factors and variables which affect operation are: (1) the nature of the compound (2) the size and shape of the section (3) the type of feed (4) the condition and form of the material as it is brought to the extruder (5) the type and style of die head (6) the condition of the extruder itself, such as amount of wear, type of drive and other factors.

Taking item 6 above, as an example, one may easily see how the character of the extrusion would be altered if condition of machine wear were to be ignored. For instance, the clearance between the extruder screw and liner varies with the number of hours of use and types of compounds run through the cylinder.

Following is a ready reference chart on clearances for new NRM tubers and the maximums of "worn-in" clearances for efficient operation:

Size Extruder	Total Diametrical Clearance Between Screw and Bore of Cylinder Liner	
	New Machine	Used Machine (Maximum)
2½"	.007" to .009"	.025" to .030"
3¼"	.008" to .010"	.028" to .033"
3½"	.010" to .012"	.030" to .035"
4½"	.010" to .012"	.030" to .035"
6"	.012" to .015"	.050" to .055"
8"	.013" to .016"	.055" to .060"
8½"	.013" to .016"	.055" to .060"
10"	.017" to .020"	.060" to .065"
12"	.017" to .020"	.060" to .065"

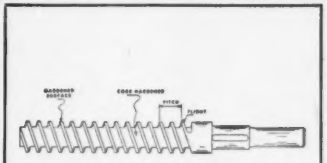
In addition, the equipment engineer should always consider the machinery design features which can affect operations on special extruding jobs. Some of these are:

1. Drive—Variable speed DC or constant speed AC with variable speed coupling.
2. Transmission—Worm gear or double herringbone gear reductions.
3. Quick changeability of screws, liners, and dies.
4. Screw characteristics, single or double lead, constant or variable pitch, stelliting or flame-hardening.
5. Length of cylinder and screw; and position and size of hopper.

Because of the many variables involved, it should be clear that there is no such thing as a standard extruder that can be used for every application. Each installation must be carefully analyzed and consideration given to performance records on similar applications.

One thing you can plan on in every case—when you buy NRM you're taking advantage of over 30 years' creative engineering *and* actual manufacture experience devoted to extrusion equipment. Result: exclusive features which pay off in terms of higher quality extrusions at lower cost wherever NRM equipment is properly applied.

For complete details on NRM machinery or assistance in analyzing your extrusion processes, write or wire NRM, 47 West Exchange St., Akron 8, Ohio. No obligation!



NRM Extruder Screw showing special design features. "NRM specializes in screw designs".

EXTRUDING COLD RUBBER, OTHER SYNTHETICS REQUIRE SCREW CHANGES

As change-overs from natural rubber compounds to synthetics were made, it was found necessary to change extruder screw characteristics. The changes made compensate for differences in the frictional heat generated and for varying compression requirements.

Now, with the advent of "Cold Rubber", it has been found necessary to again examine screw flight characteristics so as to obtain maximum efficiency and quality of extruded product.

For example, changing compression ratio was indicated in order to get uniform flow from the die with no tendencies to pulsate. Also, the most success is now being obtained with a double flight screw (*see drawing at left*).

In addition, cold rubber extrusion has also made it necessary to change the flight contours or fillets between flights and the root diameter. Corrosive tendencies of cold rubber have also required a change in the surface condition of the entire flight length.

You can obtain complete, detailed information on rubber extrusion and processes by writing NRM—*specialists in screw design.*

Small, Compact Bench Model Extruder Ideal for Lab. Work

NRM's 1" Bench Model extruder is small, compact and versatile. With a nominal capacity of 6-10 lbs. per hour, the Bench Model is *tops* for either laboratory work, small capacity regular production or both.

Particularly, the 1" model is ideally suited for laboratory operations where runs are small. A large volume of stock is not required to load the Bench Model's cylinder. The 1" extruder is complete with a ¾ hp. AC motor, a worm gear reducer and interchangeable spur gears to give a wide range of screw speeds and a vari-pitch sheave for fine speed adjustment.

The NRM Bench Model is suitable for checking extruding characteristics on many types of compounds through various die shapes including a small crosshead. Write for complete information on ways this 1" "pilot plant" can save you time, trouble and money!

The NRM 1" Bench Model is available both for electrical or steam heat. The cylinder is lined with a hard-surfaced, long-wearing Xaloy material.

NATIONAL RUBBER MACHINERY CO. General Offices & Engineering Laboratories Akron 5, Ohio

PLANTS at Akron and Columbiana, Ohio and Clifton, N. J.
AGENTS East: National Rubber Machinery Co., Clifton, N. J.
West: S. M. Kipp, Box 441, Pasadena 18, Calif.
EUROPE Rubber Machinery: GILLESPIE & COMPANY
96 Wall Street, New York 5, N. Y.

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Natural or synthetic
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RED 297
Strong Color on the Orange Side
RED 347
Slightly Deeper Mass Tone with Blue Cast
RED 387
Still Deeper Mass Tone — Bluer Cast

For wide variety of uses, high quality and uniformity these clean, bright reds are stand-outs. New, highly modernized plant and equipment and precise production controls have made them better than ever. Note these desirable characteristics.

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- Fine particle size
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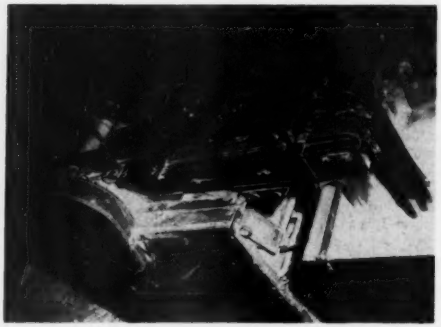
New Rubber Dicing Unit

A new dicing machine for chopping strands of rubber from an extruder to specified lengths for molding units, incorporating several features not previously employed in machines of this type, was recently developed by Ball & Jewell, Inc., 24 Franklin St., Brooklyn 22, N. Y. The machine is so designed that the speed may be adjusted



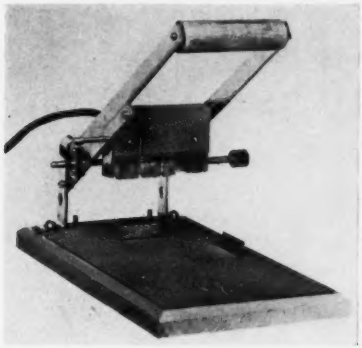
to synchronize the operation of the chopper with the speed of the extruder. A secondary variable speed principle permits varying the speed of the cutting knives independently of the over-all speed of the machine, thereby permitting variation in the length of the pellet produced. This variation will run from ¼-inch to 1½-inch in pellet length. The unit will handle material from the smallest strand up to a cross-sectional diameter of 1¼ to 1½ inches. By making the operation continuous at least one operator, and in some cases two operators, have been eliminated. The Ball & Jewell dicer is equipped with solid tool steel knives and is capable of very close clearance settings to accomplish a clean cut. The accompanying illustration depicts one of the new dicers in operation at the plant of the Bond Rubber Co. in Derby, Conn. Strands are being fed to the unit direct from the bath after leaving the extruder.

Lester Die Testing Machine

A new die testing machine which opens and closes dies with such accuracy that the parting line can be matched perfectly before the die leaves the tool room has been developed by the Lester Engineering Co., 2711 Church Avenue, Cleveland 13, Ohio. In operation, the two halves of the die are clamped to the two machine platens. The bottom platen moves down and then moves out horizontally. The die is then at a convenient height and out in the open so that it can easily be reached. It can then be quickly moved in and up, in perfect alignment for checking. Engineering-wise, the machine is unique in that the oil cylinders are located inside of two of the vertical columns. The bottom plate is the movable one, yet there is no need for a pit to accommodate an oil cylinder. The machine has a locking pressure of 50 tons. The vertical die opening is 36 inches and minimum die height is 14 inches. The overall height is 112 inches; width, 68 inches, and it is 136 inches long. The unit uses a 10 hp motor.

Wynnliner Gold Stamping Press

A simplified gold stamping press especially designed for the manufacturers of rubber flooring has been developed by the Wynn Manufacturing Co., 5110 Germantown Avenue, Philadelphia 44, Penna. Known as the Wynnliner, the press is said to have numerous uses, as in the identification of rubber floor tiles, etc. Since the press prints objects which are paper thin up to 2 inches



in thickness, it can also be used for imprinting many other items. The electrically-heated Wynnliner imprints single lines up to 3 inches in length in gold, silver and colors. It takes up to 36 point type of any standard make and prints from changeable type, dies and linotype. The unit consumes only 30 watts of 110-volt AC or DC current and prints from foil, eliminating the necessity of working with inks. The heated type chase quickly swings from typesetting to printing position, so that the operator can render fast imprinting service.

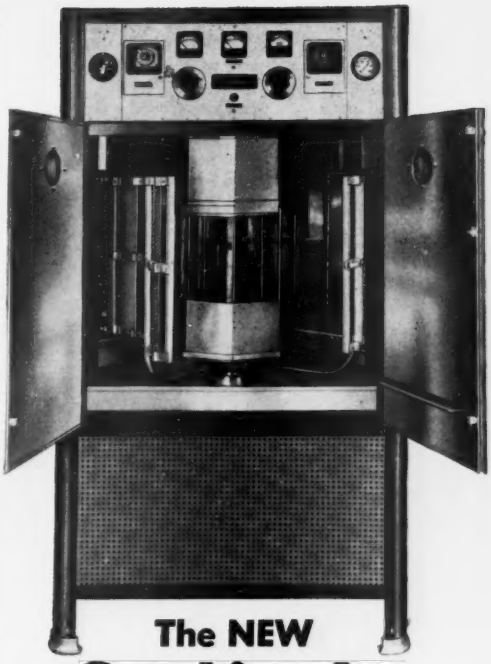
A **non-lubricated cylindrical plug industrial control valve,** which provides leak-proof shut-off while eliminating contamination, has been developed by the Belfield Valve Division of the Minneapolis-Honeywell Regulator Co., Philadelphia 44, Penna. Torque tests show that the cylindrical valve's greatest torque requirement, about 250 inch-pounds at a line pressure of 250 psi., is equivalent to a force of only 12½ pounds acting on a lever arm 20 inches long.

LATEX FOAM SPONGE

A comprehensive treatise on the manufacture of latex foam sponge, including equipment, compounding, molds, costs, patents, etc., is available at moderate cost to interested companies.

For information

Address Box 720, RUBBER AGE



The NEW

Sunshine Arc Weather-Ometer

Type XW

A modernized and redesigned version of the open flame X-1 and X-1-A Weathering Units

Many of the control features that have proven their dependability in the Atlas Twin Arc Weather-Ometer have been combined with some features of the original X-1-A weathering unit to make a new Weather-Ometer of advanced design.

In the Type XW a new means of maintaining constant temperature is provided. Far more accurate temperature control is now available.

Radiation is from a Sunshine Carbon Arc which is of the motor-driven, open-flame type. Natural sunlight or intensified ultra-violet radiation is available depending upon the type of carbons and filters used. The light source has been improved to provide 16 hours of continuous operation as well as a number of other added conveniences.

All instruments are located on a convenient control panel, including an arc voltage setting switch and meter, cycle control of light and water spray, 1 to 24 hour shut-down time switch, thermo-regulator and running time meter.

Type XW is fully automatic and may safely be left in unattended operation overnight. If deionized water is to be used, aluminum spray piping can be furnished. The capacity of the stainless steel lined testing chamber is 54 panels. The machine is sturdily constructed and is shipped assembled, ready for connection.

ATLAS ELECTRIC DEVICES COMPANY

361 West Superior St., Chicago 10, Ill.

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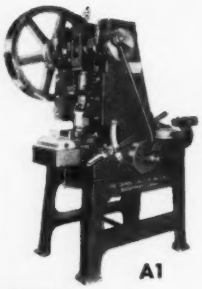
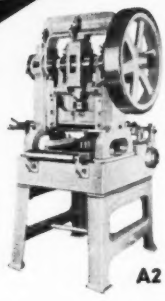
For MORE than Half a Century the name COULTER has meant MORE in higher quality cuttings . . . MORE IN GREATER PRODUCTION. So much MORE that . . .


A1

Men who Know PRODUCTION MACHINES Choose

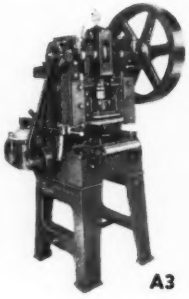
the James COULTER Machine Co.
BRIDGEPORT, CONN.

MODEL A-1
Cutting Heels at high speed production or short runs.


A2

MODEL A-2
Cutting Multiple Heels, Half and Full Soles with stock grain.

MODEL A-3
Cutting Multiple Heels and Taps with or across stock grain.


A3

MODEL A-2s
(Not illustrated)
Cutting across grain of stock.

COULTER PRODUCTION MACHINES SINCE 1896

Emmett Merit Ceramic Valve

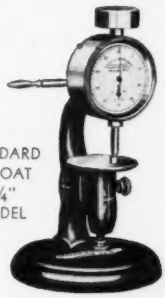
Especially designed for applications involving highly corrosive conditions as well as extreme temperatures, a new Merit valve produced by Emmett Machine & Manufacturing, Inc., 2249-32 Fourteenth St., S. W., Akron 14, Ohio, incorporates a body made of newly-

developed "Merit Ceramic." The valve is suitable for continuous 300 psi operation at temperatures up to 2000° F. to control the flow of highly corrosive gases and concentrated or diluted chemicals, with the exception of hydrofluoric acid and hot alkali concentrate. The valve bodies are machined from a solid slug of new ceramic prior to final firing. The finished body has a hardness nine-tenths that of diamond, with tensile strength of 27,000 psi, compressive strength of 290,000 psi, specific gravity of 3.63, and modulus of elasticity of 40,200,000. In addition, this ceramic will not absorb any moisture. The valves are available in ½, ¾, 1½, 2, and 3-inch sizes.

SEE PAGE 136

RANDALL & STICKNEY

THICKNESS GAUGES FOR RUBBER



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THROAT DEPTHS
1¾" to 26"

FOOT TENSIONS
supplied by Internal Spring or Direct Weights

FOOT DIAMETERS
⅛" to 1¼"

ROLLS
Table and Roll or two Rolls

RANGE
½" or 1", also 1 CM Metric

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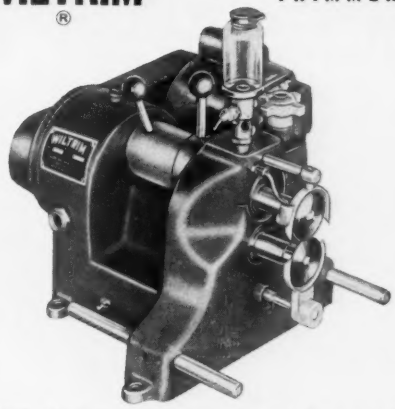
WILTRIM®

Model DF TRIMMER



Wills thirty-five years experience brings you this outstanding successor to the famous earlier Models D, DE, and DM trimmers.

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WILLS RUBBER TRIMMING DIVISION
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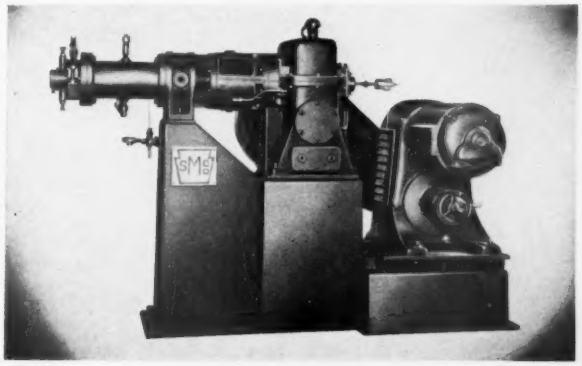
They'll Turn

RUBBER into DOLLARS
Faster!

That's why more and more firms, large and small,

Specify

DAVIS-STANDARD EXTRUDERS!!



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- 2" Cylinder bore.
- Generous Tempering Jackets.
- Xaloy Cylinder Liner.
- Longer Cylinder.
- New Stock Screw Design.
- Exclusive "Stream-flo" Head Design.
- Proven Extra Production.

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Natural or synthetic, the instruments made by Scott Testers, Inc. can immeasurably assist you in standardizing your supplies and controlling quality of product . . . as they have done for over 50 years for the rubber manufacturers throughout the world.

*Scott Testers include numerous models for tensile, hysteresis, compression-cutting, adhesion, flexing, brittle-point, state of cure, etc., from 1 gram to 1 ton tensile.

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Standard of the World

REVIEWS

BOOKS

Frontiers in Colloid Chemistry. Edited by R. E. Burk and Oliver Grummitt. Published by Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N.Y. 6 x 9 in. 158 pp. $4.00.

This volume, the eighth in the series, concludes the publication of the lectures given at Western Reserve University under the title "Frontiers in Chemistry." Six lectures on colloid chemistry are reproduced in the current volume, the titles and authors being as follows: The Role of Adsorption in Colloid Science, by Hugh S. Taylor, Princeton University; Frontiers in Chromatographic Adsorption Analysis, by Harold H. Strain, Stanford University; Ion Exchange with Special Reference to Synthetic Resins, by Robert J. Myers, Rohm & Haas Co.; Sedimentation, by V. R. Damerell, Western Reserve University; Colloidal Electrolytes, Wetting Agents, and Detergents, by James W. McBain, Stanford University; and Organization of Crystals and Micelles of Soap—Solubilization and Detergency, also by Dr. McBain.

•

Doing Business in America. (Publication No. 4). By Frank G. Opton. Published by the Netherlands American Chamber of Commerce, De Lairesstraat 13, Amsterdam, The Netherlands. 6 x 9½ in. 97 pp. $4.00.

Of particular interest to exporters and merchants seeking business in the United States, this book surveys common principles of business law as they apply throughout this country. Such matters as qualification, licensing, registration, taxation, contracts, corporations, banking and financing and other topics of general and specific interest are discussed. The book also considers such matters as agency and employment relations. The foreign business man or his adviser, through the use of this book, may acquaint himself with the fundamental rules and problems which are important to him if he does business with or in the United States.

•

Tufted Textile Manufacturers Association 1950 Directory and Yearbook. Published by the Association, Box 256, Dalton, Georgia. 8¼ x 11¼ in. 114 pp. Paper Bound. $5.00.

This is the first edition of a combined directory and yearbook covering the field of tufted textile products. In addition to a list of association members and their products, the book contains several articles on selling, advertising, laundering, dyeing, manufacturing, standards, trade terms and other data on tufted textile products. The article on "Tufted Rugs" contains mention of the use of latex for rug backing with illustrations of a drying and curing oven and a latex spraying unit. Among suppliers of latex for backing rugs listed in the directory section are Dee's Adhesives & Chemicals, Flintkote, Pioneer Latex, Southern Latex, and the Burkhard-Schier Chemical Co.

•

The Chemistry of Industrial Toxicology. By Hervey B. Elkins. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York, N. Y. 5½ x 8½ in. 406 pp. $5.50.

A study of industrial poisons from the chemical viewpoint, this book provides detailed data on the toxicology, physical characteristics, and maximum allowable concentrations of some 200 elements and compounds commonly produced in industrial operations. Emphasizing the importance of control of fumes and dust in the prevention of occupational illness, the author discusses the major methods of testing industrial processes for dangerous substances. The book also contains additional information on the determination of 64 toxic substances in air and 12 toxic substances in urine.

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You will find that the new Thropp Hydraulic Brake will stop the travel of in-running rolls almost instantly.

They can be applied to any existing mill or calender in your plant. We will be glad to send you complete installation data on request.

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UTILITY

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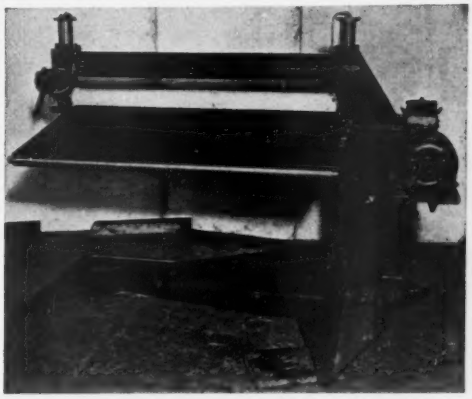

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REVIEWS (CONT'D)

ASTM Standards on Adhesives. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penna. 6 x 9 in. 60 pp. $1.25.

Sponsored by ASTM Committee D-14 on Adhesives, this booklet contains in convenient form all 15 ASTM standards relating to this field. Test methods cover resistance of adhesive bonds to chemical reagents; tensile properties of adhesives; applied weight per unit area of dried adhesive solids and liquid adhesive; peel or stripping strength of adhesives; strength properties of adhesives in shear by compression loading and in plywood type construction in shear by tension loading. There are tests for viscosity and total solids content of rubber cement; methods of sampling and testing latices of natural and synthetic rubbers; also methods of testing rubber adhesives. There is a recommended practice for determining the effect of artificial (carbon-arc type) and natural light on the permanence of adhesives. Also included are definitions of terms relating to adhesives. New material in this edition includes tests for impact strength of adhesives; strength properties of metal-to-metal adhesives in shear by tension loading; and cleavage strength of metal-to-metal adhesives.

•

Les Dérivés Chimiques du Caoutchouc Naturel. (The Chemical Derivatives of Natural Rubber). By J. Le Bras and A. Delalande. Published by Dunod, 92 Rue Bonaparte, Paris-6e, France. 5¼ x 8½ in. 486 pp. Paper Cover. 1,880 fr. (approximately $6.00 at current rate of exchange). In French.

This is one of the most comprehensive works devoted to the various chemical derivatives of natural rubber, including halogenated derivatives, hydrohalogenated derivatives, oxidized derivatives (such as Rubbone), and cyclized rubber. In each instance details are furnished on manufacturing processes, chemical and physical properties, and industrial applications, among the latter being the use of the derivatives in paints and varnishes, electrical insulation, plastics, and molding powders. There are seven chapters in all, with extensive bibliographies appended to each. There is also a comprehensive subject index. Not only do the authors discuss the various chemical derivatives of rubber which are commercially available, but also indicate several avenues of exploitation for the future.

BOOKLETS, CATALOGS, etc.

Pensions for Employees. Published by the Chamber of Commerce of the State of New York, 65 Liberty Street, New York 5, N. Y. 6 x 9 in. 90 pp. $1.00.

This booklet represents a compilation of the proceedings of the Pension Forum held on February 16, 1950, at the Hotel Astor in New York City, sponsored by the Committee on Industrial Problems and Relations and the Committee on Education of the Chamber of Commerce of the State of New York. The addresses presented at the forum relating to the social and economic manifestation of various pension plans are reproduced in entirety. A section of the booklet is devoted to the questions which were raised at the forum, and the answers as presented by the speakers.

•

Effect of Oil-in-Water Emulsions on the Swelling of Neoprene Vulcanizates. (BL-236). Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 6¼ x 9½ in. 8 pp.

This technical report represents the results of an investigation undertaken to determine the swelling effects of various types of oil emulsions on some typical neoprene vulcanizates. The volume increase for each of the indicated compounds after 28 and 90 days' immersions in emulsions of various concentrations is shown.

Painting with Aluminum. Aluminum Company of America, 801 Gulf Bldg., Pittsburgh 19, Penna. 8½ 11 in. 32 pp.

Designed for industrial users of aluminum paint, this booklet points out that while the company does not make or sell aluminum paints, it feels obligated to explain how aluminum paints can be used to best advantage. The booklet emphasizes that uses of aluminum paint by business and industry fall into three classifications: (1) for metal, concrete, masonry and similar non-absorbent surfaces; (2) for weather-exposed wood; and (3) for interior heated surfaces and for decorative uses. Profusely illustrated, the book uses 30 photographs to show proven application of aluminum paints over the years, ranging from oil refineries and coal tipples to industrial fencing and bridges. Several pages are devoted to questions and answers and an aluminum paint coverage table.

•

Cabot Carbon Blacks Under the Electron Microscope. Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass. 8½ x 11 in. 85 pp.

Electron micrographs and particle size data for all Cabot carbon blacks have been assembled in this booklet to enable compounders to select the proper grade of black for specific uses and to interpret the performance and behavior of carbon black in its many applications. The booklet is divided into two sections, one treating with the company's color and ink blacks and the other with its rubber blacks. The procedure used in securing the electron micrographs and particle size data is outlined in an appendix. Typical analytical properties of each of the various Cabot blacks are also listed, including nigrometer scale, volatile content, apparent density, pH, and electrical resistance. The micrographs are of 50,000 magnification.

•

Vibration Control. (Catalog C-102). Korfund Co., Inc., 48-57-B 32nd Place, Long Island City 1, N. Y. 8½ x 11 in. 4 pp.

Characteristics of the various types of vibration isolation media —springs, rubber, and cork materials—are presented in this catalog. Typical machine and equipment applications are tabulated with recommendations for proper types of vibro-isolators for highest efficiency, and with alternates for satisfactory operating efficiency for less exacting requirements. Various types of standard mountings are described with data or loading ranges which run from 10 pounds for small isolators to 50,000 pounds per isolator for a heavy duty spring type. Specific purpose isolators for business machines, fan and motor units and other applications are also described. Typical specification clauses for installation contracts are also given.

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LONDON

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To maintain a scheme of Diplomas for the recognition of efficiency in knowledge of all branches of technology essential to the successful maintenance and development of rubber manufacture.

To arrange for the holding of meetings, the reading of papers and the giving of lectures with subsequent discussions and publication.

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To encourage original work and research dealing with the manufacture of rubbers.

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REVIEWS (CONT'D)

Indonex Plasticizers in Low Cost Butyl Compounds.. (Circular No. 13-39). Indoil Chemical Co., 910 So. Michigan Ave., Chicago 80, Ill. 8½ x 11 in. 6 pp.

An earlier technical bulletin issued by Indoil Chemical covered the use of Indonex plasticizers in low cost Butyl mechanical goods using high loadings of carbon black. The present bulletin furnishes test results on a series of Butyl mechanical goods compounds with and without ground scrap and with and without Butyl reclaim, all with Indonex Plasticizer 638½. The investigation covered twenty-four compounds and physical data on each is presented. The test results are reported to indicate the desireability and economy of such compounds in various automotive and other applications.

•

Zinc Oxides for Every Purpose. American Zinc Sales Co., P.O. Box 327, Columbus 16, Ohio. 5 x 7½ in. 24 pp.

Considerable data on the American Zinc, Lead and Smelting Company and its full line of AZO zinc oxides for industry is contained in this two-color booklet. The booklet briefly describes the zinc oxides which are marketed by the American Zinc Sales Co. and classifies them so as to assist the purchasing and technical departments of its customers. Chemical data is shown for each of the different brands, with its rubber, paint and other uses designated. Several unretouched photomicrographs of the various types of zinc oxides are reproduced in the booklet. There is also some data on their bulking values.

•

Hardesty Fatty Acids. W. C. Hardesty Co., Inc., 41 East 42nd St., New York 17, N. Y. 8½ x 11 in. 16 pp.

This catalog lists complete specifications and shipping data on a complete line of fatty acids which include stearic acid, red oil, animal and vegetable and fish oil fatty acid, stearine pitch and glycerine. Also included are three data charts showing composition of fats and oils, color standards comparator and temperature conversion tables.

•

Why Glycerine? Glycerine Producers Association, 295 Madison Ave., New York 17, N. Y. 8½ x 11 in. 16 pp.

Basic technical data of concern to chemists, engineers, etc., with interesting facts about usage of glycerine for the non-technical buyer, are presented in this booklet. Included are tables of specific gravity, viscosity, freezing point, etc., of aqueous glycerine solutions at various concentrations, and a bibliography of references.

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SEE PAGE 136

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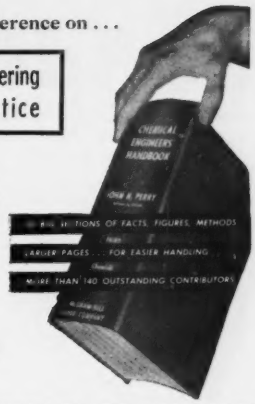

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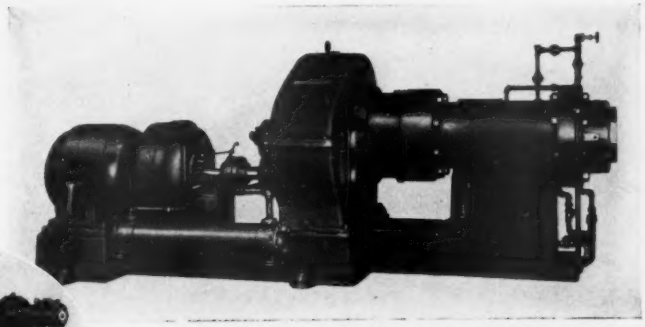

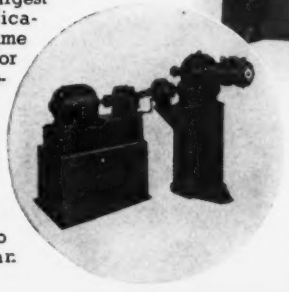

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MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, MAY 4, 1950

Natural Rubber

The price of spot rubber on the Commodity Exchange has continued the upward climb first evidenced during the prior period. Since our last report (April 6), the price of spot rubber hit a high of 26.00 cents on May 2, and a low of 23.00 cents on April 14 and again on April 17, a variation of 3 cents. The average price of spot rubber for the month of April was 23.51 cents based on 19 trading days. This compares with an average of 19.86 cents in March.

According to trade sources, rubber's remarkable rise in recent weeks has been due primarily to the declared policy of the United States of stimulating the use of natural rubber and increasing stockpile purchases to alleviate Britain's dollar shortage. Sterling devaluation and the close balance of the suply and demand position have also strongly aided recovery.

Continuation and acceleration of the price upswing in recent weeks is, however, meeting with widespread disapproval. Postwar regulations governing trading on the London Rubber Exchange were framed for the purpose of eliminating speculation, and leading interests are said to be unanimous in deprecating the market's present state.

Calculations at all leading centers have been upset by the hoarding of Indonesian supplies due to currency and labor troubles. Conditions in that area are chaotic and there are serious doubts as to whether estimates for this quarter will be realized.

Today's quotations on the outside market, London and Singapore, follow:

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.26
May	.26
June	.25½
Thin Latex Crepe:	
Spot	.26¾
May	.26¾
Thin Brown Crepe, No. 2	.22½
Ambers, No. 3	.22½
Flat Bark Crepe	.20

London Market

(Standard Smoked Sheets)

June	25.23 - 25.67
July-September	24.06 - 24.21

Singapore Market

(Standard Smoked Sheets)

June	23.22 - 23.30

Synthetic Rubber

(Dry Types-Per Pound)

Butaprene NF	.440 - .450
Butaprene NL	.450 - .460
Butaprene NAA	.490 - .500
Butaprene NXM	.520 - 530
Chemigum 30 N4NS	.400 - .470
Chemigum 50N4NS	.400 - .470
Chemigum N3	.450 - .520
GR-I	—— - .185
GR-S	—— - .185
Hycar OR-25	.450 - .460
Hycar OR-15	.520 - .530
Hycar OS-10	.500 - .510
Neoprene Types CG and AC	—— - .500
Neoprene Type E	—— - .650
Neoprene Types FR and KNR	—— - .750
Neoprene Type GN	—— - .320
Neoprene Type GN-A	—— - .320
Neoprene Type RT	—— - .350
Neoprene Type S	—— - .320
Neoprene Type W	—— - .350
Paracril 18	.430 - .450
Paracril 26	.440 - .460
Paracril 35	.510 - .530
Silastic (compounded)	2.35 - 4.40
Thiokol Type A	.370 - .470
Thiokol Type FA	.520 - .620
Thiokol PR-1	.750 - .850
Thiokol Type ST	.750 - .850

Scrap Rubber

A fairly substantial improvement has been noted in the scrap rubber market during the past period. Scrap tires and tubes are reported to be moving more freely, although demand is not pressing for any particular grade. Some export demand has been noted with recent shipments going to Spain and Italy. These shipments were bringing slightly higher prices than those quoted domestically. Current quotations follow:

Mixed passenger tires	ton	$13.00
Beadless truck tires	ton	nom.
Mixed truck tires	ton	15.00
Beadless passenger tires	ton	nom.
No. 1 passenger peelings	ton	42.50
No. 1 truck peelings	ton	42.50
Red passenger tubes	lb.	.07
Black passenger tubes	lb.	.03½
Mixed passenger tubes	lb.	.04
No. 2 truck tubes	lb.	nom.
Red truck tubes	lb.	.07
Black truck tubes	lb.	.03¾
Buffings	ton	15.00

Reclaimed Rubber

Consumption of reclaim for the month of March is estimated at 22,286 long tons by the Department of Commerce, compared with the 19,741 tons consumed in the previous month. A primary reason for the brisk demand for reclaim has been the relatively high price of natural rubber. Production and consumption remain at satisfactory levels, and the outlook for reclaim continues optimistic. Current quotations follow:

Tires

Black, Digester (Natural)	lb.	.08¼ - .08¾
Peels No. 1	lb.	.08¼ - .08¾
Whole Tire (Blend)	lb.	.08¼ - .08¾

Inner Tubes

Black (Natural)	lb.	.11½ - .12
Red (Natural)	lb.	.13½ - .14½
Butyl	lb.	.08¼ - .08¾

Shoe

Unwashed (Natural)	lb.	.08¾ - .09¼

Cotton Tire Fabrics

The stepped up production of tires plus an inadequate supply of synthetic fibers have tended to increase the demand for cotton tire fabrics. Some quarters tend to view this situation as temporary, citing the projected increase in the production of synthetic fibers. Increased demand, however, is expected to continue for the next few months. Current quotations follow:

Standard, Peeler, 12/4/2	lb.	.68
Standard, Peeler, 14/4/2	lb.	.70
Standard, Peeler, 16/4/3	lb.	.7250
Extra Staple, Peeler, 12/4/2	lb.	.8315
Extra Staple, Peeler, 14/4/2	lb.	.8575
Extra Staple, Peeler, 16/4/3	lb.	.8825

Chafers

14.4 oz. (per sq. yard)	lb.	.67
9.25 oz. (per sq. yard)	lb.	.63
11.65 oz. (per sq. yard)	lb.	.60
8.9 oz. (per sq. yard)	lb.	.6475

Cotton

The price of middling uplands on the Cotton Exchange has moved in the rather narrow range of 45 points since our last report (April 6), high for the period being 33.53 cents reached on April 29, and low being 33.08 cents reached on April 13. The average price of middling uplands for the month of April was 33.23 cents based on 22 trading days. This compares with an average of 32.65 cents for March.

Cotton trade representatives are urging the Agriculture Department to extend the July 31 termination date for 1949 cotton crop loans until November or December to give growers more time to get their cotton out of the loan and sell it on the free market. A year ago, directors of the Commodity Credit Corporation decided that cotton put in the loan under the regular price support operation was to be pooled for producers' accounts on August 1.

Economic Cooperation Administration authorizations have been heavy recently, aggregating $36,785,000 for cotton since the latter part of April. Of this, France received $20,000,000 and the United Kingdom $15,000,000.

Senator A. J. Ellender (Dem., La.) has urged the removal of raw cotton from the Economic Cooperation Administration's bulk commodity classification. ECA price review officials have made it clear they would go on checking prices charged by cotton shippers on ECA-financed exports even if the Ellender amendment to the foreign aid authorization bill was enacted. ECA officials take the position that prices of export cotton must be checked.

Quotations for middling uplands on the Exchange follow:

	Apr. 6	May 4		
	Close	High	Low	Close
May	32.48	32.68	32.34	32.42
July	32.57	32.83	32.51	32.58
Oct.	30.66	31.53	31.08	31.13

Closing Rubber Prices on New York Commodity Exchange

(No. 1 R.S.S. Contract)

FROM APRIL 7 TO MAY 4

Apr.	Spot	June	July	Sept.	Dec.	Sales
7	——	——	——	——	——	——
8	——	——	——	——	——	——
9	——	——	——	——	——	——
10	23.50	22.85	21.80	20.80	19.80	74
11	23.50	23.20	22.30	21.30	20.30	78
12	23.50	22.70	21.80	20.60	19.60	197
13	23.38	22.20	21.50	20.50	19.50	129
14	23.00	22.20	21.50	20.50	19.55	51
15	——	——	——	——	——	——
16	——	——	——	——	——	——
17	23.00	22.40	21.75	20.75	20.00	128
18	23.12	23.40	22.50	21.60	20.95	243
19	23.75	23.30	22.55	21.50	20.90	142
20	23.75	23.25	22.55	21.65	21.00	109
21	23.75	23.70	23.20	22.40	21.85	187
22	——	——	——	——	——	——
23	——	——	——	——	——	——
24	24.50	24.95	24.40	23.70	22.80	152
25	25.50	24.70	24.48	23.50	22.70	72
26	25.00	23.70	23.49	22.60	21.75	125
27	24.75	23.60	23.45	22.45	21.40	97
28	24.62	24.55	24.40	23.20	22.40	120
29	——	——	——	——	——	——
30	——	——	——	——	——	——
May						
1	25.25	26.00	25.45	24.00	23.00	116
2	26.25	25.90	25.25	23.30	22.20	80
3	26.00	25.20	25.54	22.70	21.50	255
4	25.25	25.70	24.94	23.00	21.80	75

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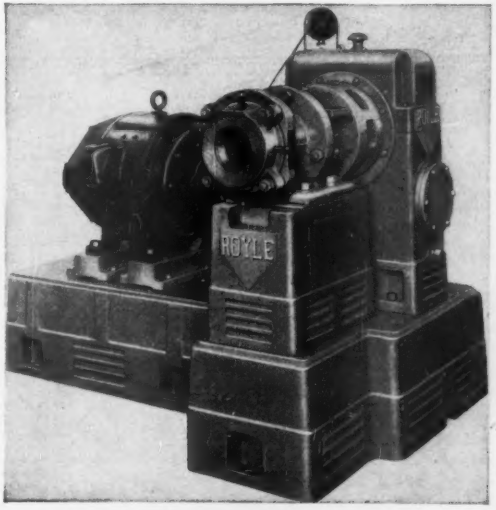

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STATISTICS *Of Interest to the Rubber Industry*

U. S. Imports and Re-Exports of Natural Rubber

	GROSS IMPORTS										RE-EXPORTS		TOTAL NET IMPORTS
	Natural Rubber (Dry)			Natural Rubber (Latex)			Guayule						
Year	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Total Gross Imports Long Tons	Long Tons	Total Declared Value	Long Tons
1936	467,064	152,072,496	14.54	19,852	6,659,899	14.98	1,229	286,552	10.41	488,145	12,581	4,488,223	475,564
1937	574,600	237,307,041	18.44	23,185	10,213,670	19.67	2,694	745,873	12.36	600,479	7,902	3,385,433	592,577
1938	397,640	125,373,864	14.08	11,944	4,168,127	15.58	2,508	628,886	11.19	412,092	5,652	1,799,124	406,440
1939	469,946	167,586,786	15.92	27,437*	10,467,552	17.03	2,233	463,345	9.27	499,616	13,125	5,832,618	486,491
1940	781,202	303,308,823	17.33	33,789	14,593,466	19.28	3,633*	758,007	9.31	818,624	7,060	3,197,136	811,564
1941	989,498	401,976,317	18.14	34,797*	15,965,627	20.48	4,881	1,145,767	10.48	1,029,176	5,376	2,757,872	1,023,800
1942	266,276	112,537,426	18.87	10,646	5,630,667	23.61	5,523	1,660,792	13.42	282,445	10,856	5,913,386	271,589
1943	50,358	31,369,198	27.81	1,890	1,312,202	31.00	7,678*	3,636,789	21.14	59,926	22,583	16,446,707	37,343
1944	103,847	73,908,549	31.77	3,091	2,092,211	30.99	6,701*	3,351,233	22.33	113,639	9,739	8,712,695	103,900
1945	134,408	95,814,102	31.82	4,733	3,115,853	30.22	10,040	5,963,797	26.52	149,221	9,509	7,201,746	139,712
1946	366,415	222,552,939	27.12	8,421	5,843,085	29.14	5,344	2,859,246	23.89	380,180	7,711	5,331,954	372,469
1947	691,087	306,951,814	19.83	17,542	9,787,722	30.98	2,884	1,492,825	23.11	711,513	4,121	2,354,494	707,392
1948	702,293	290,849,177	18.49	32,745	9,820,080	24.93	302	71,330	10.53	735,340	6,672	3,259,324	728,668
1949	630,818	225,341,459	15.95	29,974	14,970,478	22.30	....	.....	....	660,792	6,253	2,746,109	654,539
1948:													
Aug.	**65,736**	**26,975,557**	**18.33**	**2,395**	**1,389,495**	**25.81**	....	.....	....	**67,771**	**520**	**268,912**	**67,251**
Sept.	49,119	21,480,244	19.52	1,434	813,347	25.24	....	.....	....	50,553	514	229,016	50,039
Oct.	58,300	26,161,356	20.03	2,728	1,574,419	25.83	....	.....	....	61,028	675	320,570	60,353
Nov.	**49,800**	**22,292,055**	**19.98**	**813**	**466,895**	**25.59**	....	.....	....	50,613	772	349,315	49,841
Dec.	83,419	35,495,327	19.00	4,216	2,366,959	24.75	....	.....	....	87,635	569	250,540	87,066
1949:													
Jan.	**66,575**	**27,037,698**	**18.13**	**1,132**	**634,165**	**25.02**	....	.....	....	**67,707**	**757**	**320,036**	**66,950**
Feb.	**55,234**	**21,549,791**	**17.41**	**2,159**	**1,030,107**	**21.30**	....	.....	....	**57,393**	**434**	**211,323**	**56,959**
Mar.	53,768	20,095,422	16.68	2,809	1,564,383	24.87	....	.....	....	56,577	562	245,780	56,015
Apr.	48,262	18,167,840	16.85	2,271	1,219,404	23.97	....	.....	....	**50,533**	**315**	**165,632**	50,218
May	51,243	18,827,018	16.40	2,191	1,105,887	22.54	....	.....	....	53,434	390	181,457	53,044
June	49,038	18,084,566	16.47	2,180	1,113,169	22.80	....	.....	....	51,218	471	226,882	50,747
July	43,474	15,502,688	15.76	2,267	1,146,784	22.59	....	.....	....	45,741	699	289,896	45,042
Aug.	46,853	15,828,526	15.08	2,725	1,342,109	21.98	....	.....	....	49,578	251	110,368	49,327
Sept.	43,476	14,069,331	14.45	2,144	1,095,225	22.81	....	.....	....	45,620	556	248,921	45,064
Oct.	44,651	14,678,475	14.66	2,634	1,213,360	20.57	....	.....	....	47,285	404	160,047	46,881
Nov.	63,641	20,693,593	14.51	3,512	1,645,360	20.89	....	.....	....	67,153	11	9,002	67,142
Dec.	63,982	20,770,607	14.49	3,952	1,860,525	21.02	....	.....	....	67,934	689	295,362	67,245
1950:													
Jan.	54,277	17,881,882	14.71	3,974	1,951,793	21.92	....	.....	....	58,251	431	225,196	57,820

Source: U. S. Department of Commerce. * Adjusted to agree with total gross imports.

Notes: (1) Figures for latex are on a dry weight basis. (2) Figures for re-exports include natural rubber (dry and latex) and guayule. (3) In the years 1940 through 1943, crepe sole rubber imports were reported under a separate classification. Such imports, which are included under natural rubber, dry above, were: 856,294 pounds, valued at $191,097 in 1940; 379,607 pounds, valued at $85,924 in 1941; 662,503 pounds, valued at $159,530 in 1942; and 21,653 pounds, valued at $5,215 in 1943.

Natural Rubber
(Including Latex and Guayule)

(All Quantities in Long Tons)

Year	New Supply	Consumption	Re-Exports	Stocks On Hand at End of Period
1936	**488,145**	**575,000**	**12,581**	**223,000**
1937	**600,479**	**543,600**	**7,902**	**262,204**
1938	**411,983**	**437,031**	**5,652**	**231,500**
1939	**499,473**	**592,000**	**13,125**	**125,800**
1940	**818,243**	**648,500**	**7,060**	**288,864**
1941	**1,029,007**	**775,000**	**5,376**	**533,344**
1942	**282,653**	**376,791**	**10,856**	**422,714**
1943	**55,329**	**317,634**	**20,815**	**139,594**
1944	**107,834**	**144,113**	**9,665**	**93,650**
1945	**135,672**	**105,429**	**6,743**	**118,715**
1946	**400,687**	**277,597**	**4,338**	**237,467**
1947	**688,354**	**562,661**	**4,101**	**129,038**
1948	735,227	627,332	6,673	141,541
1949	660,792	574,522	6,253	106,619
1948:				
Aug.	**68,131**	**53,366**	**520**	**129,622**
Sept.	**50,556**	**52,131**	**514**	**123,912**
Oct.	**61,027**	**49,617**	**675**	**118,187**
Nov.	**50,671**	**51,632**	**746**	**113,251**
Dec.	87,634	45,985	569	141,541
1949:				
Jan.	67,706	50,188	757	125,050
Feb.	57,401	46,285	434	118,803
Mar.	**56,577**	**53,108**	**562**	117,664
Apr.	50,533	47,859	315	112,916
May	53,510	46,128	390	111,875
June	51,218	47,117	471	103,626
July	46,277	40,597	699	103,017
Aug.	49,579	45,307	251	99,850
Sept.	45,620	43,978	556	100,618
Oct.	47,285	51,243	404	90,733
Nov.	67,152	52,093	701	99,208
Dec.	67,934	52,919	713	106,619
1950:				
Jan.	58,251	59,992	431	108,769
Feb.	53,393	56,580	558	104,477
Mar.	61,481	60,809	659	101,898

Source: 1936-40, U. S. Department of Commerce; 1941 to date, Rubber Division, OMD, and Predecessor Agencies.

U.S. Gross Imports of Balata, Jelutong, Gutta-Percha, etc.

(All Quantities in Long Tons)

	Balata		Jelutong		Gutta-Percha & Other Guttas	
Year	Tons	Value	Tons	Value	Tons	Value
1936	535	199,368	6,163	1,296,364	1,568	555,643
1937	354	151,344	7,109	2,017,786	1,122	440,894
1938	509	181,140	9,132	2,944,504	444	204,582
1939	694	265,553	6,640	1,603,418	1,740	539,255
1940	648	300,500	7,451	2,449,137	2,340	1,004,885
1941	924	489,514	8,821	2,954,001	1,783	607,025
1942	1,544	1,107,059	1,200	530,296	804	525,763
1943	1,047	708,701	35	14,840	....	.....
1944	1,012	660,805	86	45,578	10	4,999
1945	1,361	907,253	....	.....	36	21,970
1946	2,281	2,233,065	304	256,169	423	458,064
1947	1,982	2,276,531	2,878	1,496,887	392	779,591
1948	1,195	805,078	3,401	2,377,765	423	542,788
1949	1,391	814,554	1,043	834,978	197	189,021
1948:						
July	120	87,327	205	170,949	15	35,001
Aug.	59	50,511	112	107,431	53	39,607
Sept.	91	67,970	112	83,432	0	0
Oct.	83	67,726	145	181,424	0	0
Nov.	**86**	**49,155**	**48**	**36,634**	**20**	**10,572**
Dec.	83	56,896	106	108,975	24	12,324
1949:						
Jan.	46	29,922	91	93,738	19	11,934
Feb.	65	53,665	77	91,362	9	16,328
Mar.	136	86,499	60	52,313	5	30,967
Apr.	88	48,244	14	8,753	16	9,878
May	103	60,361	85	83,291	....	.....
June	44	20,821	74	47,515	27	16,292
July	164	78,112	46	37,403	5	3,391
Aug.	137	66,002	114	96,509	5	2,218
Sept.	208	122,732	91	74,605	22	31,672
Oct.	222	142,538	123	92,681	19	15,221
Nov.	77	68,678	160	89,806	34	28,559
Dec.	54	36,980	108	67,002	39	24,061
1950:						
Jan.	61	42,855	37	18,308	56	35,288

Source: U. S. Department of Commerce.

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Synthetic Rubber—Totals

(GR-S, Neoprene, Butyl, and Buna N Types)

(All Quantities in Long Tons)

Year	Production	Imports	Consumption	Exports	Stocks On Hand at End of Period
1941	8,383	.....	6,259	572	1,702
1942	22,434	.....	17,651	1,419	4,612
1943	231,722	.....	170,891	18,148	41,568
1944	762,630	11,043	566,670	104,266	142,927
1945	820,373	10,407	693,580	83,778	203,454
1946	740,026	7,709	761,699*	72,920	114,963
1947	508,702	1,093	559,566	11,385	62,366
1948	488,343	15,671	442,072	4,874	115,111
1949	393,690	17,242	390,855	6,483	98,042
1949:					
July	34,270	1,689	30,014	614	113,595
Aug.	33,885	1,745	35,630	369	111,333
Sept.	30,878	2,086	32,443	415	110,848
Oct.	28,015	1,497	33,687	420	103,955
Nov.	28,619	1,707	31,684	459	101,430
Dec.	27,234	1,578	32,277	352	98,205
1950:					
Jan.	22,178	1,659	33,966	546	92,284
Feb.	29,336	2,035	31,860	577	88,381
Mar.	33,003	2,569	37,605	621	86,949

Source: Rubber Division, OMD, and Predecessor Agencies.
Notes: (1) These figures are revised from time to time and the latest available issue should be consulted for the most accurate data. (2) Figures shown include the output of both government and privately-owned plants. (3) Figures for 1941 are estimated. * Includes year-end adjustment of 5,384 tons to cover non-reporting companies.

Synthetic Rubber—By Type

(All Quantities in Long Tons)

New Supply

	GR-S (Buna S)	GR-M (Neoprene)	GR-I (Butyl)	Buna N Types	Total
1942	3,721	8,956	23	9,734	22,434
1943	182,259	33,603	1,373	14,487	231,722
1944	679,949	56,660	20,252	16,812	773,673
1945	724,859	45,672	52,378	7,871	830,780
1946	613,408	47,766	80,823	5,738	747,735
1947	408,858	31,495	62,824	6,618	509,795
1948	405,492	34,848	56,662	7,012	504,014
1949	310,599	35,215	54,046	11,072	410,932

Consumption

1942	2,579	6,833	22	8,217	17,651
1943	131,977	26,205	304	12,405	170,891
1944	495,552	46,243	10,763	14,112	566,670
1945	600,145	42,394	43,012	8,029	693,580
1946	632,126	44,357	79,228	5,988	761,699
1947	448,589	37,703	68,838	4,536	559,666
1948	345,313	32,118	58,870	5,771	442,072
1949	299,420	31,753	50,855	8,827	390,855

Exports

1942	222	1,037	..	160	1,419
1943	14,937	2,540	40	631	18,148
1944	98,380	4,799	530	557	104,266
1945	76,555	5,837	980	406	83,778
1946	68,763	2,642	495	797	72,697
1947	7,951	2,617	62	755	11,385
1948	1,093	2,875	21	885	4,874
1949	1,401	3,330	178	1,574	6,483

Stocks at End of Period

1942	1,050	1,786	4	1,772	4,612
1943	30,975	6,415	1,033	3,145	41,568
1944	116,130	11,739	9,892	5,166	142,927
1945	176,571	9,703	18,378	4,802	203,454
1946	81,483	10,470	19,478	3,755	115,186
1947	40,606	5,237	13,184	3,339	62,366
1948	96,282	5,072	10,995	2,762	115,111
1949	77,731	4,654	12,224	3,433	98,042

Source: Rubber Division, OMD, and Predecessor Agencies.
Notes: (1) These figures are revised from time to time and the latest available issue should be consulted for the most accurate data. (2) Figures for GR-M and Buna N Types include production of privately-owned plants.

Gasoline Consumption

(In Thousands of Barrels of 42 Gallons)

	1943	1944	1945	1946	1947	1948	1949	1950
Jan.	36,085	47,540	52,008	51,746	57,057	61,308	63,083	66,908
Feb.	36,274	47,754	48,856	47,654	50,551	56,487	57,934	63,414
Mar.	41,586	52,263	55,364	56,703	59,947	68,171	73,118	.....
Apr.	48,177	50,005	59,024	62,111	64,140	72,183	75,279	.....
May	49,828	54,230	60,748	66,800	70,865	77,186	81,622	.....
June	53,325	54,266	60,580	63,247	71,329	78,044	83,338	.....
July	49,867	55,119	66,170	60,076	73,441	81,428	82,118	.....
Aug.	51,880	55,618	70,058	66,729	72,089	80,351	84,632	.....
Sept.	49,707	56,318	64,529	62,268	71,384	76,159	80,760	.....
Oct.	53,111	53,154	55,708	66,637	73,277	75,164	79,253	.....
Nov.	50,703	54,967	53,543	61,345	64,158	72,560	76,270	.....
Dec.	48,695	52,250	49,745	61,101	67,506	72,162	75,470	.....
Total	568,238	633,482	696,333	735,417	795,015	871,270	912,877	.....

Source: U. S. Bureau of Mines.

Reclaimed Rubber

(Including Natural and Synthetic)

(All Quantities in Long Tons)

Year	Production	Consumption—Tons	Consumption—% to Crude	Exports	Stocks On Hand at End of Period
1936	150,571	141,486	24.6	7,085	19,000
1937	185,033	162,000	29.8	13,233	28,800
1938	122,400	120,800	27.6	7,403	23,000
1939	186,000	170,000	28.7	12,611	25,250
1940	208,971	190,244	29.3	11,347	32,636
1941	274,202	251,231	32.2	13,851	41,750
1942	286,007[b]	254,820	64.6	30,405	42,532
1943	304,058[c]	291,082	59.6	15,678	46,201
1944	260,631[d]	251,083	35.3	11,800	43,832
1945	243,309	241,036	30.2	13,413	28,155
1946	295,612	275,410	26.5	14,461	33,666
1947	291,395	288,395	24.8	14,556	35,943
1948	266,861	261,113	24.4	11,428	32,630
1949	224,029	226,679	22.5	10,637	28,263
1949:					
Feb.	18,270	17,712	21.9	1,012	32,738
Mar.	19,991	19,508	21.2	1,054	33,397
Apr.	18,463	18,649	22.1	1,070	32,825
May	18,184	18,323	22.5	887	32,326
June	18,849	19,316	23.0	694	30,684
July	14,626	15,966	22.6	681	29,126
Aug.	17,813	19,297	24.2	612	27,526
Sept.	18,304	18,517	24.2	761	26,257
Oct.	20,683	19,638	23.3	1,107	26,619
Nov.	19,382	18,512	22.1	796	27,801
Dec.	19,723	18,210	21.5	702	28,263
1950:					
Jan.	19,472	20,106	21.4	902	27,319
Feb.	20,474	19,741	22.2	790	27,256
Mar.	23,036	22,286	21.5	988	27,517

Source: 1936-40, Department of Commerce; 1941 to date, Rubber Division, OMD, and Predecessor Agencies.
Notes: (1) These figures are revised from time to time and the latest available issue should be consulted for the most accurate data. (a) Includes natural and synthetic rubber. (b) Includes 893 tons of imports. (c) Includes 67 tons of imports. (d) Includes 21 tons of imports.

Automobile Production in U. S.

(Civilian Production Only)

Year	Passenger Cars	Trucks	Total	Year	Passenger Cars	Trucks	Total
1930	2,784,745	571,241	3,355,986	1940	3,692,328	721,637	4,413,965
1931	1,973,090	416,648	2,389,738	1941	3,744,500	875,381	4,619,681
1932	1,135,491	235,187	1,370,678	1942	220,814	133,083	353,897
1933	1,573,512	346,545	1,920,057	1943	0	4,501	4,501
1934	2,177,919	575,192	2,753,111	1944	0	124,819	124,819
1935	3,252,244	694,690	3,946,934	1945	83,792	313,643	397,435
1936	3,669,528	781,862	4,451,390	1946	2,148,699	930,760	3,079,459
1937	3,915,889	892,382	4,808,271	1947	3,558,178	1,220,634	4,778,812
1938	2,000,985	485,852	2,486,837	1948	3,909,270	1,363,856	5,273,126
1939	2,866,796	704,308	3,571,104	1949	5,108,841	1,123,736	6,232,577
1949:							
Jan.	326,019	104,599	430,618	July	483,261	95,348	578,609
Feb.	324,547	101,700	426,247	Aug.	557,370	99,850	657,220
Mar.	402,402	115,171	517,573	Sept.	534,493	91,389	625,882
Apr.	436,392	106,212	542,604	Oct.	487,891	84,704	572,595
May	394,703	86,200	480,903	Nov.	381,951	72,749	667,881
June	493,882	99,126	593,008	Dec.	285,930	66,688	352,618
1950:							
Jan.	487,854	93,622	581,476	July	.....	.....	.....
Feb.	385,025	89,668	474,693	Aug.	.....	.....	.....
Mar.	469,529	109,717	579,246	Sept.	.....	.....	.....
Apr.	.....	.....	.....	Oct.	.....	.....	.....
May	.....	.....	.....	Nov.	.....	.....	.....
June	.....	.....	.....	Dec.	.....	.....	.....

Source: Automobile Manufacturers Association.
Note: Figures are based on factory sales. Revisions are made from time to time in these figures and the latest issue should be consulted for accuracy.

Rim Production

	1945	1946	1947	1948	1949
Passenger Car	4,504,368	15,058,469	21,346,004	23,842,796	27,715,344
Truck & Bus	6,386,652	5,939,244	7,737,353	6,920,231	4,238,174
Agricultural	1,441,909	1,735,992	2,633,699	3,140,882	2,695,430
Earth Mover	1,308	5,520	10,610	13,330	9,895
Total	12,434,237	22,739,225	31,727,666	33,917,239	34,658,843

	1949 Oct.	1949 Nov.	1949 Dec.	1950 Jan.	1950 Feb.	1950 Mar.
Passenger Car	2,478,051	1,332,637	2,312,926	2,673,886	2,312,926	2,368,168
Truck & Bus	268,408	189,423	449,357	512,432	449,357	525,330
Agricultural	194,837	135,976	225,703	230,092	225,703	271,077
Earth Mover	155	809	578	408	578	576
Total	2,941,451	1,658,845	2,988,564	3,416,818	2,988,564	3,165,151

Source: The Tire & Rim Association, Inc.

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Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1938 (total)	11,516	30,567	1,049	43,132	40,907	8,451
Passenger Car.	10,086	27,104	580	37,770	35,789	6,937
Truck and Bus	1,430	3,463	469	5,362	5,118	1,514
1939 (total)	18,208	38,022	1,279	57,509	57,613	8,665
Passenger Car.	15,742	33,471	607	49,820	49,933	7,108
Truck and Bus	2,466	4,551	672	7,689	7,680	1,557
1940 (total)	22,252	35,346	1,176	58,774	59,186	9,127
Passenger Car.	19,560	30,903	411	50,874	50,965	7,270
Truck and Bus	2,692	4,443	765	7,900	8,221	1,857
1941 (total)	24,780	39,895	1,489	66,164	61,540	4,436
Passenger Car.	19,855	34,119	586	54,560	50,392	3,165
Truck and Bus	4,925	5,776	903	11,604	11,148	1,271
1942 (total)	6,680	8,872	207	15,759	15,351	6,247
Passenger Car.	910	2,734	38	3,682	2,790	4,432
Truck and Bus	5,770	6,138	169	12,077	12,561	1,815
1943 (total)	6,128	18,547	225	24,900	20,423	1,883
Passenger Car.	82	10,606	71	10,759	7,620	1,132
Truck and Bus	6,046	7,941	154	14,141	12,803	751
1944 (total)	6,654	26,439	263	33,356	33,446	2,013
Passenger Car.	208	18,330	130	18,668	18,819	1,218
Truck and Bus	6,446	8,109	133	14,688	14,627	795
1945 (total)	5,984	36,479	504	42,967	44,524	3,077
Passenger Car.	1,115	25,463	222	26,800	28,200	2,214
Truck and Bus	4,869	11,016	282	16,167	16,324	863
1946 (total)	15,310	65,490	1,512	82,312	82,298	2,448
Passenger Car.	11,086	54,684	653	66,423	66,466	1,763
Truck and Bus	4,224	10,806	859	15,889	15,832	685
1947 (total)	25,056	62,871	3,256	91,183	95,550	6,949
Passenger Car.	19,644	52,857	1,608	74,109	77,795	5,444
Truck and Bus	5,412	10,014	1,648	17,074	17,755	1,505
1948 (total)	26,845	49,148	1,787	77,781	81,314	10,698
Passenger Car.	21,589	41,295	656	63,540	66,738	8,773
Truck and Bus	5,256	7,853	1,132	14,241	14,576	1,925
1949 (total)	31,588	43,474	1,467	76,530	76,372	10,651
Passenger Car.	28,125	36,432	509	65,066	65,143	8,913
Truck and Bus	3,463	7,042	958	11,463	11,228	1,738
1949:						
Nov. (total)	1,746	3,422	99	5,267	6,040	9,542
Passenger Car.	1,578	2,752	41	4,371	5,135	7,867
Truck and Bus	169	670	58	896	904	1,675
Dec. (total)	2,158	2,944	131	5,234	6,275	10,651
Passenger Car.	1,903	2,324	47	4,274	5,260	8,913
Truck and Bus	255	620	84	960	1,015	1,738
1950:						
Jan. (total)	3,094	2,703	116	5,913	6,827	11,336
Passenger Car.	2,748	2,191	49	4,987	5,711	9,489
Truck and Bus	346	513	67	926	1,117	1,877
Feb. (total)	3,247	2,870	100	6,216	6,691	11,797
Passenger Car.	2,891	2,333	37	5,261	5,606	9,785
Truck and Bus	356	537	63	956	1,085	2,012

Source: The Rubber Manufacturers Association, Inc.

Cotton, Rayon and Nylon Tire Fabrics

(Production in Thousands of Pounds)

	Cotton				Rayon and Nylon[b]		
	Tire Cord Not Woven	Cord Fabric Woven	Chafer and All Other Tire Fabrics	Total	Tire Cord Not Woven	Tire Cord And Other Tire Fabrics	Total
1946:							
Jan.-Mar.	17,128	39,377	15,245	71,750	a	51,208	51,208
Apr.-June	19,622	40,197	18,623	78,442	a	52,511	52,511
July-Sept.	17,279	39,259	18,787	75,325	5,102	46,932	52,034
Oct.-Dec.	20,660	42,668	21,708	85,036	5,858	50,589	56,447
Total	74,689	161,501	74,363	310,553	10,960	201,240	212,200
1947:							
Jan.-Mar.	21,972	49,377	21,815	93,164	5,322	52,059	57,381
Apr.-June	23,491	53,746	16,480	93,717	5,486	47,360	52,846
July-Sept.	15,571	44,291	14,596	74,458	6,161	51,719	57,880
Oct.-Dec.	18,183	48,532	17,762	84,477	6,550	55,078	61,628
Total	79,217	195,946	70,653	345,816	23,519	206,216	229,735
1948:							
Jan.-Mar.	18,546	50,251	19,391	88,188	a	60,569	60,569
Apr.-June	15,585	45,385	18,213	79,183	a	59,759	59,759
July-Sept.	29,743	45,927	c	75,670	a	63,642	63,642
Oct.-Dec.	13,321	34,424	15,879	63,624	a	65,258	65,258
Total	77,195	175,987	53,483	306,665	.....	249,228	249,228
1949:							
Jan.-Mar.	d	33,213	25,395	56,608	a	68,296	68,926
Apr.-June	5,309	29,114	13,617	48,040	a	68,269	68,269
July-Sept.	1,343	16,620	11,141	29,104	15,640	55,969	71,609
Oct.-Dec.	180	17,650	11,886	29,716	12,967	58,890	72,857
Total	6,832	96,597	62,039	163,468	28,607	251,424	281,661

Source: U. S. Bureau of the Census.

Notes: (a) Included with tire cord and fabrics to avoid disclosures of operations of individual mills. (b) Fuel cell fabrics are not included with rayon and nylon tire cord and fabrics. (c) Included with tire cord not woven. (d) Included with chafer and all other tire fabrics.

Automotive Inner Tubes

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1936	21,514	32,188	721	54,423	57,036	10,945
1937	22,464	29,554	749	52,767	52,373	10,312
1938	11,515	28,134	644	40,293	37,848	8,166
1939	18,190	31,998	1,002	51,190	50,649	7,036
1940	22,172	29,070	972	52,214	52,237	7,017
1941	24,722	33,749	1,232	59,703	57,433	4,686
1942	6,895	7,213	159	14,267	12,685	6,206
1943	6,350	12,474	189	19,014	15,014	2,626
1944	6,460	20,569	196	27,224	27,488	2,813
1945	5,988	33,906	411	40,304	41,742	3,627
1946	15,327	59,357	1,424	76,108	77,251	3,820
1947	25,046	46,560	2,483	74,088	79,181	8,059
1948	26,833	40,548	1,119	68,499	70,033	9,641
1949	31,535	31,923	891	64,349	65,564	10,713
1949:						
Aug.	3,190	3,351	61	6,603	5,169	9,858
Sept.	3,007	2,766	69	5,483	4,902	8,916
Oct.	2,940	2,538	79	5,557	5,296	8,644
Nov.	1,746	2,415	55	4,216	5,155	9,645
Dec.	2,172	1,993	58	4,222	5,339	10,713
1950:						
Jan.	3,090	2,164	58	5,312	5,629	10,926
Feb.	3,245	2,307	58	5,610	5,803	11,059

Source: The Rubber Manufacturers Association, Inc.

Smoked Sheets—Spot Closing Prices

(New York Market—Cents per pound)

Year	High	Low	Avg.	Year	High	Low	Avg.
1910	208	141	200.00	1930	16½	7½	11.98
1911	184	114	141.30	1931	8¾	4½	6.17
1912	140	108	121.60	1932	4¼	2½	3.49
1913	113	59	82.04	1933	9¼	2⅞	5.96
1914	93	56	65.33	1934	15⅞	8½	12.92
1915	79	58½	65.85	1935	13¾	10½	12.37
1916	102	55	72.50	1936	23	13½	16.41
1917	90	52	72.23	1937	26⅞	14	19.39
1918	70	40	60.15	1938	17⅜	10¼	14.64
1919	57	38½	48.70	1939	24	14⅛	17.57
1920	56½	16	36.30	1940	24	18¾	20.10
1921	21¼	11½	16.36	1941	24⅞	19½	22.40
1922	28⅜	13⅜	17.50	1942	22½	22½	22.50
1923	37⅛	24¾	29.45	1943	22½	22½	22.50
1924	40⅛	17⅜	26.20	1944	22½	22½	22.50
1925	121	34⅜	72.46	1945	22½	22½	22.50
1926	88½	36¾	48.50	1946	22½	22½	22.50
1927	41¾	33	37.72	1947	25	14	20.00
1928	41¾	17	22.48	1948	25	18	21.99
1929	26⅞	15½	20.55	1949	19¾	15⅞	17.57

Note: Price was fixed by Government on August 6, 1941, at 22½c a pound for non-war uses. Free trading was resumed May 1, 1947.

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market—in Cents)

Average Monthly Price Per Pound

	1943	1944	1945	1946	1947	1948	1949	1950
Jan.	21.34	20.76	22.36	25.49	32.58	36.09	33.37	31.89
Feb.	21.61	21.34	22.29	26.57	33.91	33.63	33.41	32.79
Mar.	21.98	21.65	22.43	27.52	35.89	35.04	33.44	32.65
Apr.	22.02	21.71	21.88	28.40	35.89	38.10	33.84	33.23
May	21.97	21.63	23.30	28.17	36.51	38.57	33.73	....
June	21.92	23.31	23.42	29.89	37.83	38.12	33.56	....
July	21.46	22.33	23.27	34.11	38.03	34.89	32.99	....
Aug.	21.09	22.11	23.10	36.31	34.83	32.23	32.06	....
Sept.	21.10	22.10	23.25	37.59	32.21	31.92	30.94	....
Oct.	21.00	22.32	23.85	36.79	32.39	32.01	30.32	....
Nov.	20.32	22.13	24.71	31.50	34.50	32.15	30.52	....
Dec.	20.32	22.28	25.21	33.03	36.74	32.90	31.08	....
Average for Year	21.34	21.89	23.25	31.28	35.11	34.64	32.44	....

Consumption of Vinyl Resins

(In Thousands of Pounds)

	Sheeting and Film [a]	Textile and Paper Coating Resins [b]	Molding and Extrusion Materials [b]	All Other [b, c]
1946	52,080	11,673	61,852	27,083
1947	66,430	17,237	73,114	27,064
1948	98,021	31,085	73,598	21,147
1949	157,544	29,470	81,842	19,792
1949:				
Aug.	12,849	2,125	6,330	816
Sept.	15,818	2,632	7,807	1,718
Oct.	17,354	2,675	9,058	1,383
Nov.	18,171	3,094	9,254	1,740
Dec.	16,567	2,955	10,586	1,781
1950:				
Jan.	16,467	3,507	9,756	2,182
Feb.	17,771	3,097	7,683	1,637

Source: Bureau of the Census.

Notes: (a) Includes weight of fillers, plasticizers, extenders and safety glass sheeting; (b) Resin content; (c) Includes Adhesives, but excludes data for protective coating resins.

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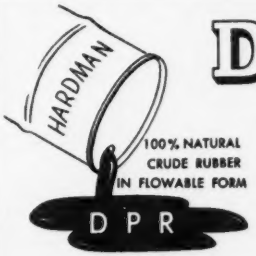

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Rubber Industry Employment, Wages and Hours

All Rubber Products

	1949				1950			
Mo.	Production Workers (thousands)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	Production Workers (thousands)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings
Jan.	201	$56.89	37.9	$1.501	187	$60.56	39.4	$1.537
Feb.	197	56.55	37.7	1.500	185	61.48	40.0	1.537
Mar.	194	55.43	37.0	1.498	...	....	...	....
Apr.	190	55.50	36.9	1.504	...	....	...	....
May	185	57.08	37.7	1.514	...	....	...	....
June	181	58.29	38.2	1.526	...	....	...	....
July	177	58.37	38.4	1.520	...	....	...	....
Aug.	180	57.72	38.3	1.507	...	....	...	....
Sept.	167	60.97	40.3	1.513	...	....	...	....
Oct.	187	59.57	39.4	1.512	...	....	...	....
Nov.	186	57.91	38.4	1.508	...	....	...	....
Dec.	187	59.19	39.2	1.510	...	....	...	....

Tires and Tubes

Jan.	91.3	60.72	35.3	1.720	82.6	67.60	38.3	1.765
Feb.	89.4	60.99	35.4	1.723	...	67.62	38.4	1.761
Mar.	88.6	61.50	35.8	1.718	...	....	...	....
Apr.	88.6	60.92	35.4	1.721	...	....	...	....
May	87.2	63.20	36.3	1.741	...	....	...	....
June	86.3	64.09	36.6	1.751	...	....	...	....
July	82.0	64.45	36.6	1.761	...	....	...	....
Aug.	80.9	62.32	36.0	1.731	...	....	...	....
Sept.	64.3	70.03	39.1	1.791	...	....	...	....
Oct.	81.1	64.83	37.3	1.738	...	....	...	....
Nov.	81.3	63.91	36.9	1.732	...	....	...	....
Dec.	82.1	64.79	37.3	1.731	...	....	...	....

Rubber Footwear

Jan.	24.8	51.86	40.2	1.290	20.1	45.87	35.7	1.285
Feb.	22.9	48.15	37.5	1.284	...	47.38	37.1	1.277
Mar.	21.9	42.07	33.6	1.252	...	....	...	....
Apr.	21.4	46.65	37.2	1.254	...	....	...	....
May	20.5	49.45	38.9	1.257	...	....	...	....
June	19.8	50.35	39.4	1.278	...	....	...	....
July	20.2	48.84	38.7	1.262	...	....	...	....
Aug.	20.3	48.78	38.9	1.254	...	....	...	....
Sept.	21.1	51.71	40.4	1.280	...	....	...	....
Oct.	21.5	49.81	39.1	1.274	...	....	...	....
Nov.	22.2	50.51	39.9	1.266	...	....	...	....
Dec.	22.1	50.23	39.8	1.262	...	....	...	....

All Other Rubber Products

Jan.	85.3	54.38	40.1	1.356	84.2	56.79	41.3	1.375
Feb.	85.1	54.05	40.1	1.348	...	56.70	41.3	1.373
Mar.	83.1	52.49	39.2	1.339	...	....	...	....
Apr.	79.6	51.69	38.4	1.346	...	....	...	....
May	77.2	52.51	39.1	1.343	...	....	...	....
June	75.3	53.85	39.8	1.353	...	....	...	....
July	74.5	54.11	40.2	1.346	...	....	...	....
Aug.	78.6	52.46	40.6	1.366	...	....	...	....
Sept.	81.4	56.28	41.2	1.366	...	....	...	....
Oct.	84.4	57.06	41.5	1.375	...	....	...	....
Nov.	82.8	54.04	39.5	1.368	...	....	...	....
Dec.	82.7	55.66	40.9	1.361	...	....	...	....

Source: U. S. Departments of Commerce and Labor.

Note: Data are based upon reports from cooperating establishments covering both full and part-time employees who worked during or received pay for the pay period ending nearest the 15th of the month. The employment series have been adjusted to levels indicated by Federal Security Agency data for 1947, and have been carried forward from 1947 bench-mark levels, thereby providing consistent series. Hours and earning data pertain only to production and related workers.

Production Index for the Rubber Industry

Production 1935-1939 = 100

(Based on man-hours)

	1948	1949	1950		1948	1949	1950
Jan.	223	193	194	July	200	175	...
Feb.	215	188	196	Aug.	207	178	...
Mar.	205	182	...	Sept.	205	202	...
Apr.	200	177	...	Oct.	205	192	...
May	201	178	...	Nov.	203	187	...
June	205	178	...	Dec.	200	192	...

Source: U. S. Department of Commerce.

Sales by the Rubber Industry

(In Millions of Dollars)

	1948	1949	1950		1948	1949	1950
Jan.	271	260	276	July	331	271	...
Feb.	265	251	...	Aug.	331	295	...
Mar.	270	260	...	Sept.	317	277	...
Apr.	285	257	...	Oct.	294	262	...
May	273	248	...	Nov.	291	262	...
June	299	266	...	Dec.	280	266	...

Source: U. S. Department of Commerce.

Rubber Manufacturers' Inventories

(Based upon Book-Value)

(In Millions of Dollars)

	1948	1949	1950		1948	1949	1950
Jan.	608	661	558	July	648	625	...
Feb.	625	661	...	Aug.	641	586	...
Mar.	634	653	...	Sept.	661	562	...
Apr.	625	648	...	Oct.	650	537	...
May	632	650	...	Nov.	667	587	...
June	645	644	...	Dec.	650	584	...

Source: U. S. Department of Commerce.

Various Compounding Materials Consumed by the Rubber Industry

Material	1942	1943	1944	1945	1946	1947	1948
Asphalt [a]							
Short tons	22,263	16,510	20,189	19,483	28,715	32,113	19,967
% of total	.006	.005	.006	.005	.007	.007	.004
Barite (Barytes):							
Short tons	6,334	8,000	10,000	10,000	20,000	17,000	18,000
% of total	3.6	3.9	2.9	2.1	4.4	3.1	2.85
Carbon Black:							
Short tons	147,974	236,737	369,015	402,193	470,732	471,790	424,038
% of total	88.5	90.3	94.6	95.5	95.3	94.3	91.0
Clay, Kaolin:							
Short tons	51,334	50,964	59,588	109,936	162,393	166,201	176,965
% of total	5.1	5.5	6.8	11.7	12.3	11.5	11.3
Clay, Fire & Stoneware:							
Short tons	5,000	10,259	7,160	7,800	12,951	17,970	15,480
% of total	0.1	0.2	0.1	0.1	0.2	0.2	0.2
Lead Sulfate, Basic:							
Short tons	89	131	268	200	.....	.....	.....
% of total	1.1	2.3	4.2	5.2	..	..	..
Lime:							
Short tons	1,381	2,039	5,634	7,170	3,193	589	.....
% of total	0.02	0.05	0.13	0.10	0.1	0.01	..
Litharge:							
Short tons	3,460	4,302	3,023	1,864	2,131	2,205	2,835
% of total	3.8	3.8	2.2	1.3	1.6	1.3	1.8
Lithopone:							
Short tons	1,047	1,078	726	977	1,607	3,085	4,192
% of total	0.8	0.8	0.5	0.7	1.1	1.9	3.0
Mica, Ground:							
Short tons	1,754	3,063	1,137	3,715	4,951	3,900	12,275
% of total	3.7	6.0	2.2	7.1	8.0	6.0	19.0
Sulfur:							
Short tons	40,000	51,000	63,000	64,960	72,800	72,800	70,560
% of total	1.4	1.8	1.9	2.0	2.2	1.8	1.7
Talc [b]							
Short tons	40,487	48,994	51,833	63,758*	65,980	71,840	66,226
% of total	10.0	11.8	13.0	16.0	14.4	13.9	13.0
Zinc Oxide:							
Short tons	52,717	67,898	59,518	63,447	83,776	82,248	82,895
% of total	53.0	47.4	42.3	49.6	53.1	51.2	54.9

Source: U. S. Bureau of Mines.

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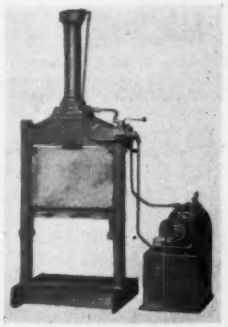

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